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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal.

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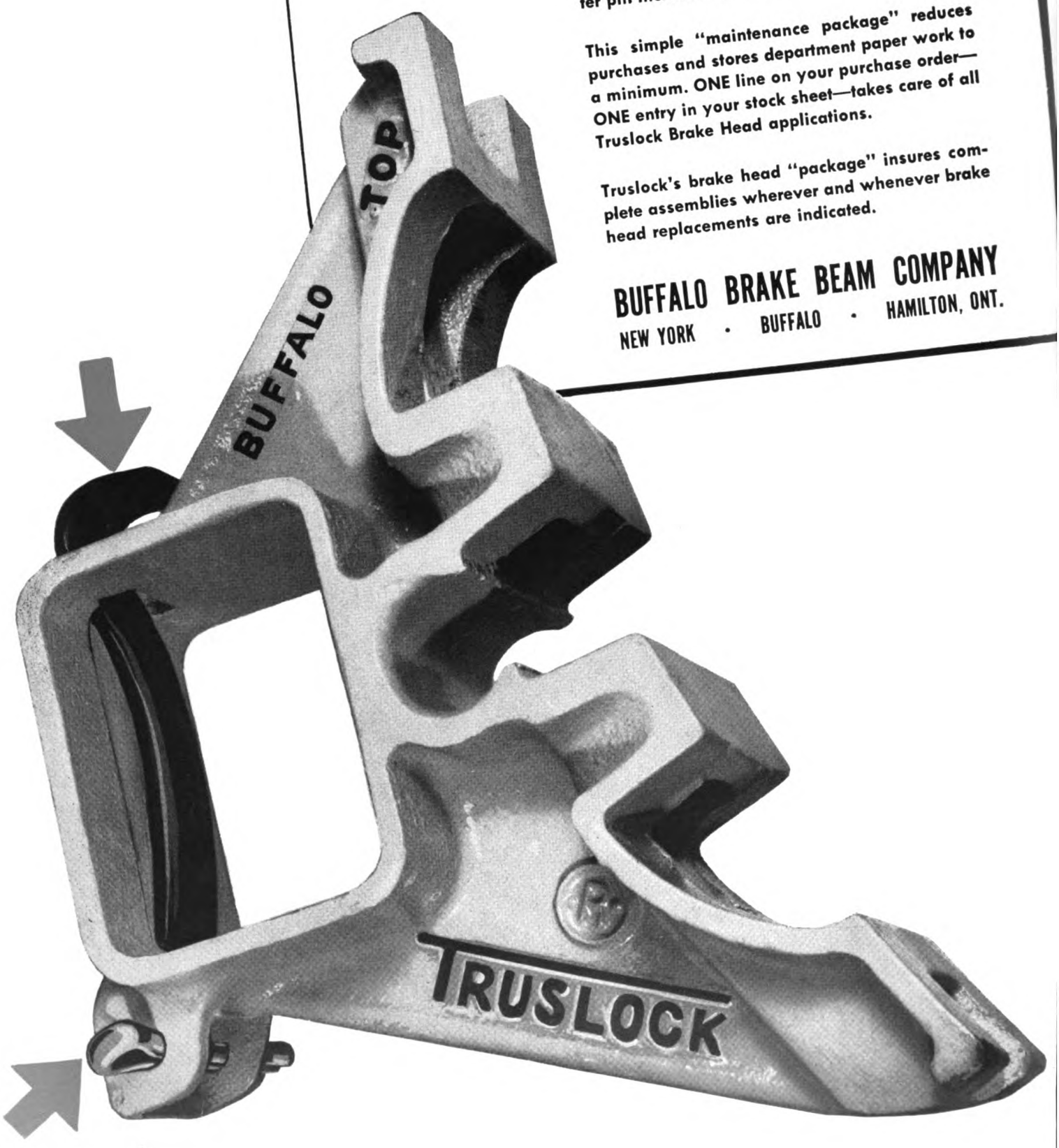

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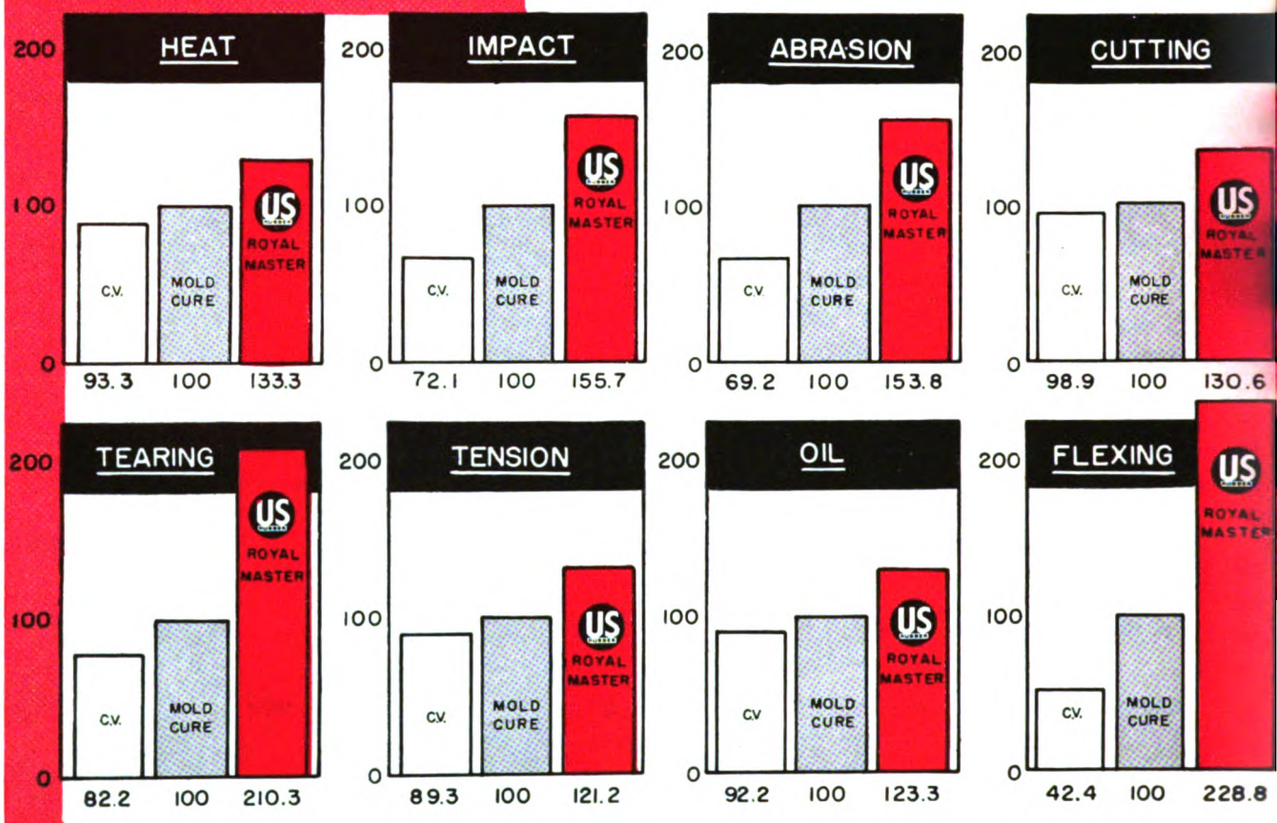

Comparative performance of portable cords related to major life factors.

Graphs illustrate the outstanding superiority of new U. S. Royal Master Cord — over the average of molded cords and the average of short-lived continuous vulcanized cords of other makes — on every major life factor. (Average of other molded cords is rated at 100%.)

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Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, as the charts at left illustrate, new U. S. Royal Master is a finer, more durable cord—actually gives 88% longer life than the average of competitive molded cords—far longer than *any* other cord—surpassing even a hypothetical cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord — in both service life *and* economy! Get in touch with your "U. S." distributor today!

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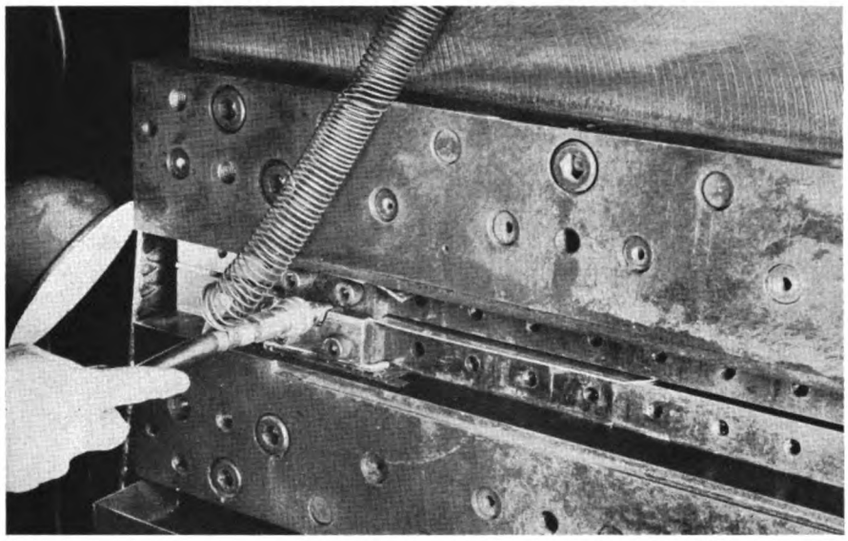
EQUIPMENT... *New Ideas—New Uses*



With plate held securely in a hydraulic press, hydraulic pressure is applied through hose to dilate the stop-weld pattern.

Homogeneous Sheet Heat Exchanger

A development in metals promises, according to the manufacturer, to change current design and production techniques in every industry dealing with temperature control. The process makes it possible to create any pattern of tubing within a single homogeneous sheet of metal such as aluminum, copper, many of its alloys, and stainless steel.

The process, a modification of the old art of roll bonding, has already been proved commercially in the refrigeration industry. There it has reduced retooling costs for new evaporator plates from $50,000 to $50; cut retooling time from a usual six months to one week; lowered end product and production costs, and at the same time, increased efficiency of the plates by more than 25 per cent.

Heat transfer throughout the sheet is the same as the metal used. With copper, there is 100 per cent conductivity; with aluminum there is about 60 per cent conductivity. There is complete grain growth with the bonding metal. The bond is as strong as the original metal.

Any pattern that can be drawn on a piece of paper can be reproduced as tubing within a metal sheet. As many as six sheets of metal can be bonded at one time. Complicated parallel or multiple tubes, running at right angles in two or more layers, can be made with complete efficiency. Also, it is impossible for tubes within the plates to develop leaks.

Air-conditioning units can be made smaller, at lower cost, and more efficient. Refrigerated railroad cars of the future could be cooled by evaporator plates, in which the coolant is stored and conducted with no chance for leakage and with less parts.

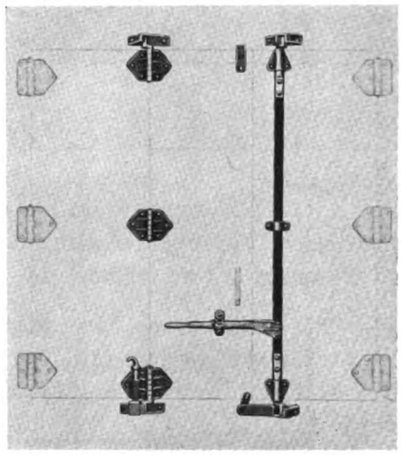
Since the sheet and tube are homogeneous, they provide maximum heat conductivity. Old methods of braze welding or soldering pipes to an evaporator plate create air spaces between tube and plate. This very greatly reduces conductivity, since heat cannot be transferred any more efficiently than the welding material's ability to transfer heat.

Elongation is 4 to 12 times original length through rolling after bonding. Normal thickness is 0.060 in. plate for refrigerators and 0.030 in. total thickness for sides of tube. Plates of 36 in. by 110 in. can be fabricated.

Magnified cross-section showing completeness of the bond. The separation at top is a corner of the dilated unbonded passageway. Complete grain growth, below, shows where stop-weld pattern has not been applied. Grain-growth is the fusing together of metal to a point where the metal, viewed under a microscope, resembles in its grain or pattern a single piece of metal. When pressure is exerted to the breaking point, failure occurs through the tube wall—never at the bond.

Real cost reduction with the new process lies in the radical design changes it makes possible. It is now possible to build the header or accumulator right into the design. This eliminates the cost of a separate attachment and the necessary brazed, stop-welded bonds. The evaporator back as well as a secondary circuit plate can be incorporated into the design and contains parts of the refrigerating system.

The product has many advantages for the transportation industry. Greatly reduced weight, increased strength, much more storage space, lower maintenance through elimination of exposed tubing and joints are some of the benefits. *Metals Division, Olin Mathieson Chemical Corporation, 505 Park avenue, New York 22.*

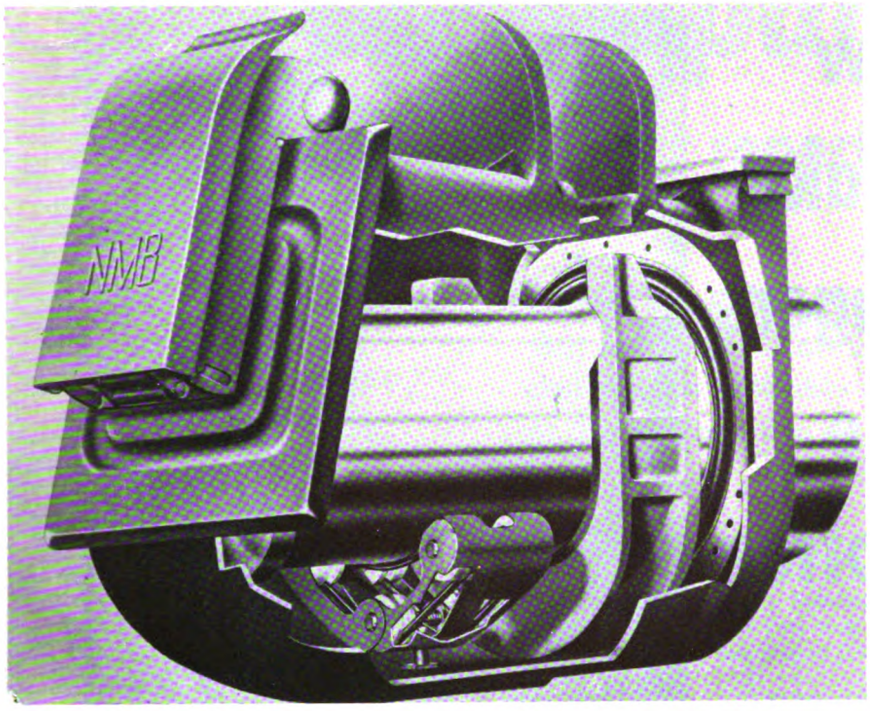


Miner Three-way Door Operator for Reefers

This three-way door operator is adjustable to 2-, 4-, or 6-ft. openings and provides a simple, efficient means of opening, closing and locking a 6-ft. refrigerator door. The arrangement enabling the 6-ft. opening requires no more platform clearance than the standard double refrigerator door which has been in use since 1909. The patented center cam arrangement and the vertical door operator with positive locking action insures a tight seal for all three sections of the door.

This door arrangement permits: (1) opening a single door for inspection of perishable commodities; (2) opening the first and second door sections for usual refrigerator car servicing; (3) opening all three door sections to a total width of 6 ft. when necessary to accommodate mechanical loading equipment.

All doors are substantially supported, with no tracks or floating fixtures to be serviced. All insulation is tightly sealed by door keepers and hinges. With doors opened, the inside faces of all doors may be cleaned from the loading platform.—*W. H. Miner, Inc., 209 South La Salle street, Chicago 4.*



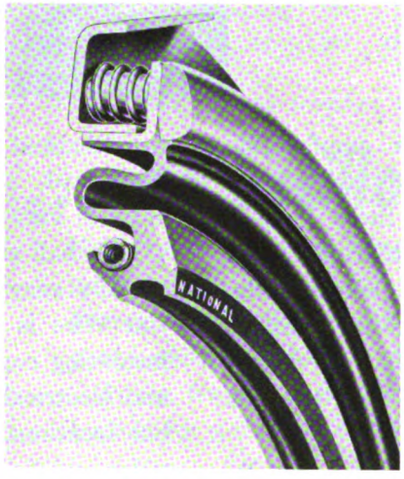
NMB sealed journal lubrication device.

Lubricating Freight Car Journals

A new system of lubricating railway freight-car journals, which is said to reduce oil consumption 90 per cent, extend bearing and axle life and eliminate the causes of more than 80 per cent, of all hot boxes, has just been given official approval by the Association of American Railroads for installation on up to 10,000 cars in interchange service. This announcement was made November 30 at a press luncheon and demonstration in Redwood City, Cal., by Lloyd A. Johnson, president of the National Motor Bearing Company, which conducted necessary research and development work at the suggestion of the Union Pacific.

The system involves devices which effectively seal freight car journal boxes at both ends to prevent loss of oil and also to keep out harmful dirt and water. Another device, activated by the journal, or axle, whenever the car is in motion, assures a continuous flow of oil to all parts within the journal-box assembly. The remaining components are guard bearings which prevent the journal from being damaged through contact with the journal box during sudden braking or violent coupling of cars. Installation does not require any alternation or machining of the journal box.

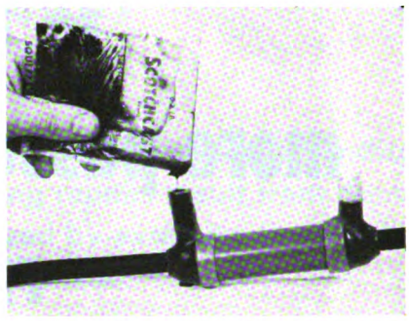
The lubricant conveyor is a spring-supported rubber-belt and nylon-roller-type device, always in contact with the lower part of the journal; the guard bearings are rubber-lined ductile iron castings in two parts; the journal-box lid presses a rubber gasket firmly against the front of the box;



How the rear oil and grease seal ring is constructed.

the rear oil seal is a composite steel-rubber ring of unique design which fits tightly in the dust guard well and around the seat on the axle; the dust-guard-well cover is placed over a plastic mesh filter and held down by two spring clips.

According to Mr. Johnson, the equipment will cost the railroads under $200 per car and the cost of replacement parts will be relatively low. Some of the devices are expected to last the lifetime of the car. The oil seals show promise of being good for 175,000 miles of service, which, translated into time, would mean about ten years, assuming that the average freight car travels 17,000 miles a year. The cost of the original equipment is expected to be amortized through savings within eighteen months. National Motor Bearing Company, Broadway at National Avenue, Redwood City, Calif.



Epoxy Resin for Splice Insulation

A method involving embedding a cable splice in liquid epoxy resin that hardens into a hermetically sealed casting has been perfected to assure factory-perfect cable splices under field conditions. No heat is required.

Basis for the method is the Scotchcast electrical embedment resin No. 4 now available in a plastic mixing envelope. All materials necessary for making a complete cable splice in a single conductor cable from wire sizes of 10 to 4 AWG are included in the kit. No tools, other than a pocket knife, are required.

In use, mold pieces are slipped on the ends of the wire, the insulation penciled down, and the spring connector turned on with the fingers. After pulling the plastic mold units into place, the mixing envelope is ruptured by squeezing, and the resin and hardener thoroughly mixed by kneading the contents.

The resin sets up in 5 to 15 min, depending on temperature. Average properties of the resin include a dielectric strength of 800 volts per mil thickness in 10 mil films; an electrolytic corrosion factor of 1.0; a dielectric constant and dissipation factor at 30 deg F of 7.2 and 0.019 respectively. It has good resistance to water, oil, solvents and weathering. *Minnesota Mining and Manufacturing Co., 900 Fauquier Street, St. Paul 6, Minn.*

Portable Vibration Meter

Capable of measuring both displacement and acceleration, this direct-reading portable vibration meter, designated as type VHA, measures over a frequency range of 10-250 cps, acceleration ranges of 0-0.03, 0-0.1, 0-0.3, 0-1, 0-3, 0-10 G, and peak to peak displacement ranges of 0-3, 0-10, 0-30, 0-100 and 0-300 mils full scale.

The meter consists principally of a barium titanate accelerometer which feeds through an electronic amplifier and a copper-oxide rectifier to an indicating mi-

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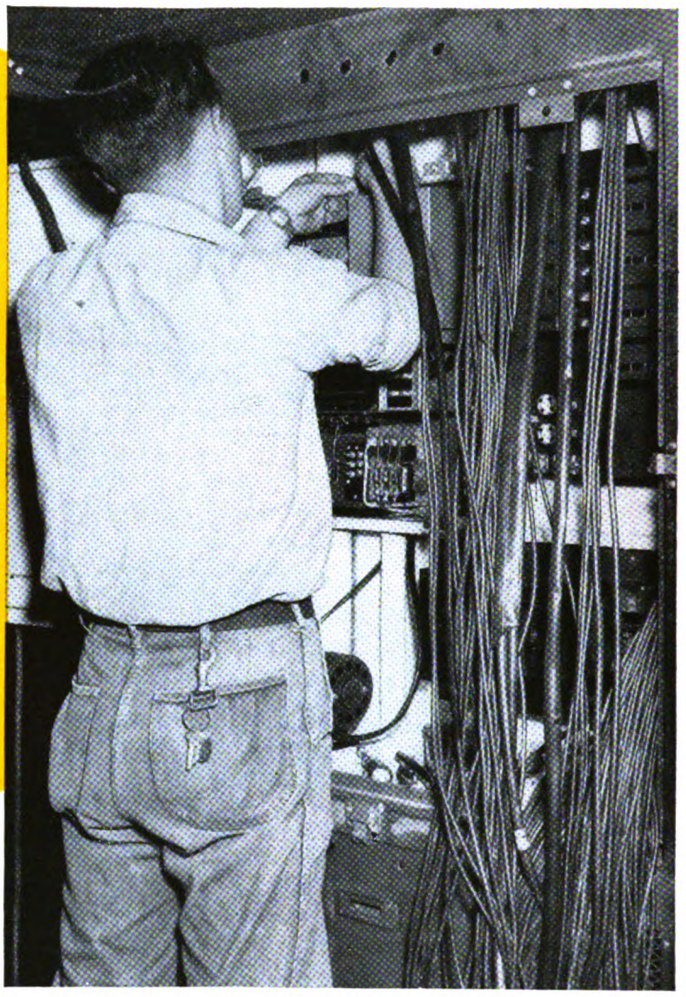
How to make more passengers ride more often



The more comfortable you make your passengers, the more passengers you will have to make comfortable. The word gets around fast about comfortable, pleasant, train trips. Dependably-operating, comfort-producing equipment like air-conditioning and lighting go a long way towards making train trips enjoyable.

Simplex Car Wire, shown above being installed in a new railroad passenger coach, helps keep this equipment functioning reliably. Able to withstand vibration, and resistant to abrasion, heat, oils, and moisture, Simplex Car Wire is very long-lived.

Its small size and light weight make it especially easy to handle and install. Simplex Car Wire is insulated with a special rubber insulating compound that retains its physical and electrical properties even in wet and/or hot locations. A tough neoprene jacket provides additional protection.

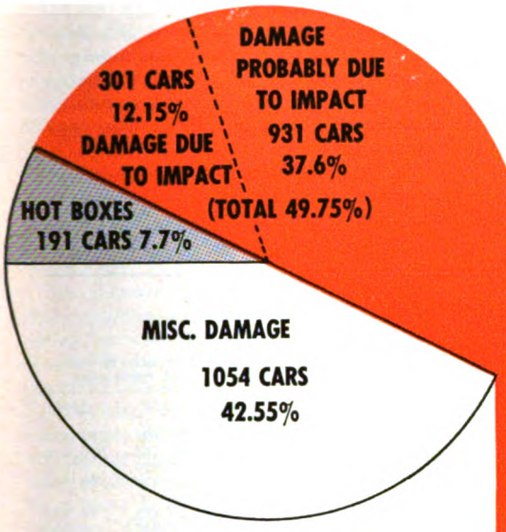
To learn more about how Simplex Car Wire can help you make more passengers more comfortable, by assuring dependable operation of air-conditioning and lighting, write to the Railroad Department at the address below.

Simplex CAR WIRE

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Cut Car-Repair Costs?

Analysis of crippled-car reports says YES!



Careful check of reports on 2477 bad-order cars indicates that roughly 50% of running repairs result from damage definitely or probably caused by excessive impact. Much of this damage can be prevented.

ANALYSIS OF CAUSES OF DAMAGE

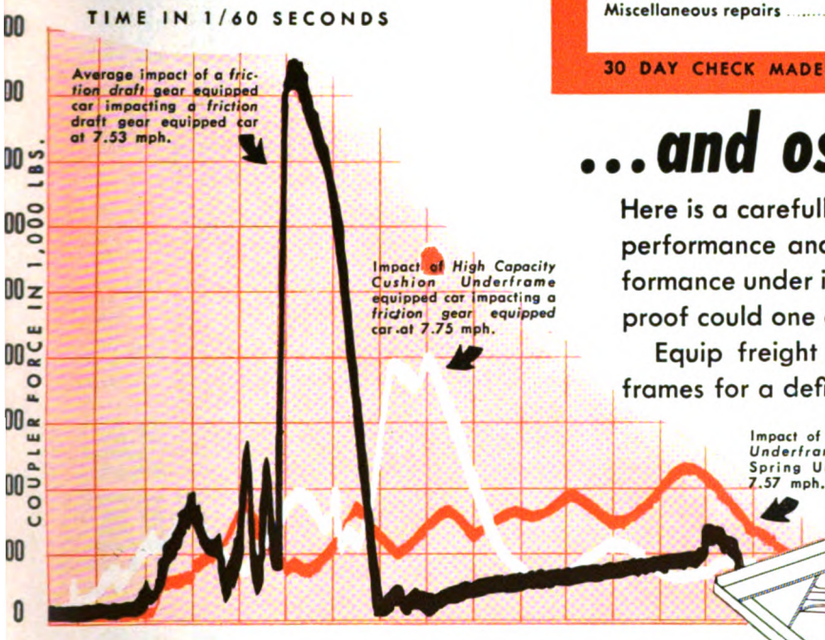
Total number of orders handled in shop (railroad owned cars and foreign cars) over 30 day period 2,477.

	No. of Cars	Per Cent
Repairs definitely due to excessive impact	301	12.15%
Repairs probably due to excessive impact	931	37.6%
Repairs due to hot-boxes	191	7.7%
Miscellaneous repairs	1,054	42.55%

30 DAY CHECK MADE JANUARY 1954

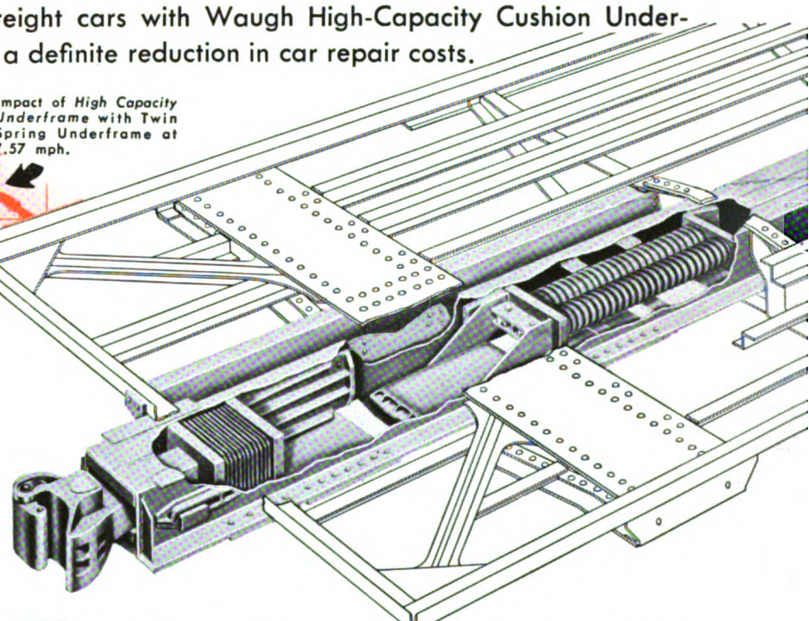
Surveys have shown that almost 80% of classification yard impacts are at speeds in excess of closing speeds for conventional draft gears and that more than 60% are in the range of 5 to 10 mph., a range in which the Waugh High-Capacity Cushion Underframe provides a high degree of protection.

...and oscillograms tell HOW!



Here is a carefully-instrumented comparative record of friction gear performance and Waugh High-Capacity Cushion Underframe performance under identical test conditions. What greater performance proof could one ask?

Equip freight cars with Waugh High-Capacity Cushion Underframes for a definite reduction in car repair costs.



WAUGH

HIGH CAPACITY

Cushion Underframe

WAUGH EQUIPMENT COMPANY 420 Lexington Ave., New York 17, N. Y.

CHICAGO · ST. LOUIS · CANADIAN WAUGH EQUIPMENT COMPANY, MONTREAL

NEWS . . .

Fitted Journal Bearings Still Show Promise

The fitted journal bearing test being conducted by the Mechanical Division of the Association of American Railroads in conjunction with the Merchants Despatch Transportation Corporation, continued to show favorable results tnrough the hot months of June, July and August. Necessary changes in AAR manuals and interchange rules, submitted for approval at the General Committee meeting in New York, November 17, were referred back to originating committees for further information and subsequent prompt handling by correspondence.

Favorable laboratory reports on fitted bearings have been received, both from the AAR Research Center and the Armour Research Foundation in Chicago. They supplement road service tests in which 1,000 cars accumulated over 19 million miles up to September 1, with only one reported heating failure in 7,078,449 car-miles charged to fitted bearings. Even this reported failure was subsequently found to be due to a cocked wedge, and the record corrected. In the same period, experience with non-fitted bearings showed 29 heating failures, or an average of 417,202 car-miles per failure.

Expressed in terms of bearing removals for heating failures resulting in car delays, the comparative performance to September 1 was: for fitted bearings—none in 7,078,449 miles; for non-fitted bearings—12 in 12,098,858 miles, or an average of 1,008,238 car-miles per failure.

It is planned to continue this test until all the bearings have been removed from service in order to appraise relative efficiencies of the two types of lining metal used and to obtain other pertinent information. Results to date, however, are so promising that the Mechanical Research Department reportedly favors prompt action to make fitted journal bearings an AAR alternate standard.

Railroad Division Installs New Officers

At the ASME, Railroad Division, luncheon in New York, December 2, notable for record-breaking attendance, A. E. Perlman, president, New York Central, challenged the Division to speed up sound, technical progress and assure the fullest cooperation between railway and supply company engineers in this exciting, new atomic age.

Dr. L. K. Sillcox, this year's retiring president of the society and honorary vice-chairman, New York Air Brake Company, presented some figures on population, employment and production trends in 1965 and 1975, compared with 1955 and said:

"So it is that we can reasonably assume a period of fairly steady growth for the next two decades; the nation will probably have 30 per cent more people than now, with industry producing about 80 per cent more goods. The standard of living in 1975 would thus naturally be considerably higher than today. The implication in this forecast is that American industry and transportation is to continue to develop labor-saving devices and to install improved equipment and that the country will be busy and productive."

The Railroad Division was especially recognized this year by two society awards. The Melville prize medal for original work

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of September 1954	Month of September 1953	9 months ended with September 1954	9 months ended with September 1953
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,693	11,759	56,181	111,980
3-06	Total, Diesel-electric	32,261	31,213	289,284	279,368
3-07	Total, electric	656	697	5,809	6,572
3-04	Total, locomotive-miles	38,822	43,756	352,476	398,514
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,511	1,650	13,423	14,982
4-06	Empty, total	843	904	7,887	8,212
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	12,075	22,171	112,341	202,589
6-02	Total in oil-burning steam locomotive trains	2,233	5,611	20,252	54,102
6-03	Total in Diesel-electric locomotive trains	89,771	87,389	798,426	781,681
6-04	Total in electric locomotive trains	2,010	1,983	17,843	18,656
6-06	Total in all trains	106,793	117,432	952,952	1,058,990
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.03	1.02	1.03
10-02	Loaded freight car-miles	41.70	40.80	40.70	40.80
10-03	Empty freight car-miles	23.30	22.40	24.00	22.30
10-04	Total freight car-miles (excluding caboose)	65.00	63.20	64.70	63.10
10-05	Gross ton-miles (excluding locomotive and tender)	2,947	2,904	2,895	2,882
10-06	Net ton-miles	1,329	1,337	1,280	1,311
12	Net ton-miles per loaded car-mile (M-211)	31.90	32 70	31.40	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.20	64.60	63.00	64.60
14	Averages per train hour (M-211):				
14-01	Train miles	18.40	18.00	18.80	18.20
14-02	Gross ton-miles (excluding locomotive and tender)	53,739	51,592	53,779	51,726
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	42.90	45.80	42.20	45.70
14-02	All	40.10	43.60	39.80	43.50
15	Average net ton-miles per freight car-day (M-240)	821	921	788	904
17	Per cent of home cars of total freight cars on the line (M-240)	51.40	44.50	53.60	46.20

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,919	3,443	20,995	39,270
3-06	Diesel-electric	20,548	20,055	187,925	181,075
3-07	Electric	1,321	1,451	12,509	13,803
3-04	Total	23,789	24,949	221,432	234,148
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	241,008	252,603	2,223,781	2,366,099
4-09	Total in coal-burning steam locomotive trains	9,442	17,689	103,280	219,908
4-10	Total in oil-burning steam locomotive trains	7,894	13,130	78,612	135,424
4-11	Total in Diesel-electric locomotive trains	209,018	205,641	1,903,444	1,857,649
12	Total car-miles per train-miles	9.75	9.75	9.67	9.79

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	278	576	2,803	5,380
1-02	Steam, oil-burning	53	93	487	979
1-03	Diesel-electric[1]	3,228	3,440	29,388	30,905
1-06	Total	3,567	4,127	32,760	37,444
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	9	17	108	183
2-02	Steam, oil-burning	6	6	45	58
2-03	Diesel-electric[1]	244	250	2,286	2,302
2-06	Total	284	306	2,672	2,834
3	Hours per yard locomotive-day:				
3-01	Steam	4.80	7.20	4.80	6.80
3-02	Diesel-electric	14.80	16.20	14.90	16.30
3-05	Serviceable	14.40	15.10	14.40	14.90
3-06	All locomotives (serviceable, unserviceable and stored)	12.30	13.50	12.30	13.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.65	1.74	1.70	1.73
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.73	.75	.74	.74

[1]Excludes B and trailing A units.

was given to Edmund Q. Sylvester, member, ASME, and president, Griffin Wheel Company for his paper "Pressure Pouring Steel Car Wheels in Permanent Molds" which was presented at the last annual meeting of the society. Frank K. Mitchell, member of the Railroad Division executive committee and assistant vice-president—management services, New York Central, was awarded a certificate as Fellow of the society for outstanding achievement in the field of railway mechanical engineering.

During the Railroad Division sessions, the following officers of the executive committee were installed for the coming year: Chairman, C. K. Steins, mechanical engineer, Pennsylvania; vice-chairman, A. G. Hoppe, mechanical engineer, Milwaukee; T. F. Perkinson, manager, Transportation Engineering Division, General Electric Company; F. K. Mitchell; F. L. Murphy, assistant vice-president, sales, Pullman-Standard Car Manufacturing Company, Washington, D. C.

The following new members of the general committee were installed: H. L. Decker, acting mechanical engineer, Pennsylvania; Rosser Wilson, vice-president, engineering, American Brake Shoe Company; F. H. Einwaechter, chief of motive power and equipment, B&O; Frank Fahland, general mechanical engineer, UP; C. E. Tack, manager product engineering, American Steel Foundries; E. H. Weston, chief mechanical engineer, C&NW; D. R. Meier, manager, Locomotive Engineering Section, General Electric Company; H. V. Gill, superintendent of shops, Santa Fe.

PERSONAL MENTION

Canadian Pacific

T. G. DINGWALL, assistant district diesel inspector at Calgary, Alta., appointed district diesel inspector at Winnipeg, Man.

J. A. FOWLE, diesel maintainer in Winnipeg, Man., appointed assistant district diesel inspector at Calgary, Alta.

R. BRYANT, diesel maintainer at Revelstoke, B. C., and Nelson, appointed assistant district diesel inspector at Moose Jaw, Sask.

C. B. HAWKINS, diesel maintainer at Winnipeg, Man., appointed assistant district diesel inspector at Winnipeg.

Georgia & Florida

L. J. WATERS, superintendent motive power at Douglas, Ga., appointed general superintendent at Augusta, Ga. Former position abolished.

L. L. CATO appointed master mechanic at Douglas, Ga., assuming duties formerly performed by superintendent motive power.

Chicago & North Western

H. H. MACILL, superintendent of motive power, appointed assistant chief mechanical officer at Chicago (not assistant chief mechanical engineer as announced in the November issue). Career: Served with the Santa Fe, Union Pacific and Missouri Pacific until 1944 when he became general foreman in the Chicago locomotive shops of

(*Continued on page 94*)

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE DECEMBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Missouri Pacific	40	1,750	Road switching	Electro-Motive
	26	1,600	Road switching	American Locomotive
Northern Pacific	14	1,750	Road switching	Electro-Motive
	4	1,750	Freight	Electro-Motive
	8	1,200	Switchers	Electro-Motive
	1	900	Switcher	American Locomotive
	6	1,600	Road switching	American Locomotive
Southern Pacific	163[1]	.....	.....	Electro-Motive American Locomotive General Electric

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	500	70-ton gondola	General American
	400[2]	50-ton box	Pullman-Standard
	250	50-ton flat	Company shops
	150	70-ton gondola	Company shops
Central of Georgia	8[3]	50-ton box	Pullman-Standard
Erie	50[4]	Flat	Bethlehem Steel
Ford Motor Co.	200	70-ton gondola	Thrall Car Mfg.
Northern Pacific	500	50-ton box	Company shops
Seaboard Air Line	500[5]	50-ton box	ACF Industries
	400[5]	50-ton box	Pullman-Standard
	100[5]	70-ton phosphate	Bethlehem Steel

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Wabash	36[6]	Sleeping	Pullman-Standard

[1] Deliveries started in December.
[2] 300 of these cars to be insulated.
[3] Estimated cost, $66,500.
[4] For piggyback service. Delivery scheduled for this month. Estimated cost, $550,000.
[5] Deliveries scheduled to begin in the first quarter of 1955.
[6] Six-roomette four-bedroom six-section type. Delivery expected during third quarter of 1955.

Missouri Pacific.—The MP has been authorized by the St. Louis Federal District Court to spend $537,260 for two new sleeping cars, installation of automatic door openers on 32 sleeping cars, conversion of two six-man dormitory grill coaches to accommodate 12 or 14 dining car crew members, and application of tightlock couplers and electric brakes to five head-end cars. Each of the new cars will contain six bedrooms and eight roomettes.

Pacific Fruit Express Company.—An order for 50 low-temperature systems specially designed for a fleet of "super" refrigeration cars to be built for Pacific Fruit Express has been announced by Charles V. Fenn, vice-president, Machinery & Systems division, Carrier Corporation. The new systems automatically provide temperatures down to minus 10 deg F, regardless of outside conditions, Mr. Fenn said.

Saudi Arabia Government Railroad.—Two prototype refrigerator cars being manufactured for the Saudi Arabian by the Societe Gregg d'Europe, S.A. Lot, associates of the Gregg Car Company of New York, will be equipped with what are believed to be the first four two-stage low temperature refrigeration compressors to be used for railroad refrigerator cars. The compressors were built by the Worthington Corporation.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
September, 1951	2,925,570,545	6,472	13,565	20,037	146,008
October, 1951	3,116,490,095	4,131	9,053	13,184	236,384
November, 1951	2,939,503,144	2,022	4,405	6,427	457,368
December, 1951	2,752,316,133	2,130	5,398	7,528	365,611
January, 1952	2,824,298,630	3,208	7,197	10,405	271,437
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477
March, 1952	2,943,812,727	2,594	5,877	8,471	347,517
April, 1952	2,766,313,714	3,826	7,759	11,585	238,784
May, 1952	2,918,508,445	6,020	10,938	16,958	172,102
June, 1952	2,672,512,889	8,466	14,495	22,961	116,394
July, 1952	2,575,298,912	10,566	15,833	26,399	97,553
August, 1952	2,924,917,122	11,658	17,535	29,193	100,192
September, 1952	2,931,129,734	7,536	13,608	21,144	138,627
October, 1952	3,093,990,289	4,058	8,053	12,111	255,469
November, 1952	2,984,101,808	2,198	4,501	6,699	445,455
December, 1952	2,869,928,617	1,742	3,632	5,374	534,040
January, 1953	2,828,906,282	2,219	4,123	6,342	446,059
February, 1953	2,625,563,462	2,111	4,059	6,170	425,537
March, 1953	2,904,227,804	2,696	6,077	8,769	331,192
April, 1953	2,850,752,648	3,383	6,435	9,818	290,359
May, 1953	3,013,610,843	5,892	11,433	17,325	173,945
June, 1953	2,926,001,360	8,537	15,296	23,833	122,771
July, 1953	2,925,317,024	9,342	15,775	25,117	116,467
August, 1953	2,971,020,484	8,638	14,160	22,798	130,319
September, 1953	2,822,222,832	6,083	10,195	16,278	173,376
October, 1953	3,042,558,922	3,863	6,493	10,356	293,796
November, 1953	2,788,773,285	1,987	3,404	5,391	517,301
December, 1953	2,656,063,018	1,581	2,550	4,131	642,958
January, 1954	2,583,485,918	3,082	3,797	6,879	375,561
February, 1954	2,445,214,845	2,953	4,066	7,019	348,370
March, 1954	2,658,757,249	2,196	3,637	5,833	455,813
April, 1954	2,570,518,990	3,079	5,149	8,228	312,411
May, 1954	2,713,511,223	4,416	6,510	10,926	248,353
June, 1954	2,662,375,708	6,597	9,617	16,214	164,202
July, 1954	2,678,234,554	7,956	10,912	18,868	141,946
August, 1954	2,696,135,660	7,568	9,742	17,310	155,756
September, 1954	2,614,432,913	6,740	8,882	15,622	167,355

faster, smoother

The watchwords of today's American railroads—faster, smoother travel—are typical of the Pennsylvania Railroad's stream-liner, the Spirit of St. Louis, which makes the trip between St. Louis and New York an enjoyable experience for the traveler.

Gulf Dieselmotive Oil contributes to the fine performance of the giant Diesel engines that power the Spirit of St. Louis and many other crack trains. Here's how this top quality Diesel locomotive lubricant helps keep maintenance costs down, availability up:

1 Effective detergent action prevents harmful piston ring belt deposits.

2 Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.

3 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Write, wire, or phone your nearest Gulf office today, and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company • 1822 Gulf Building, Pittsburgh 30, Pa.

GULF

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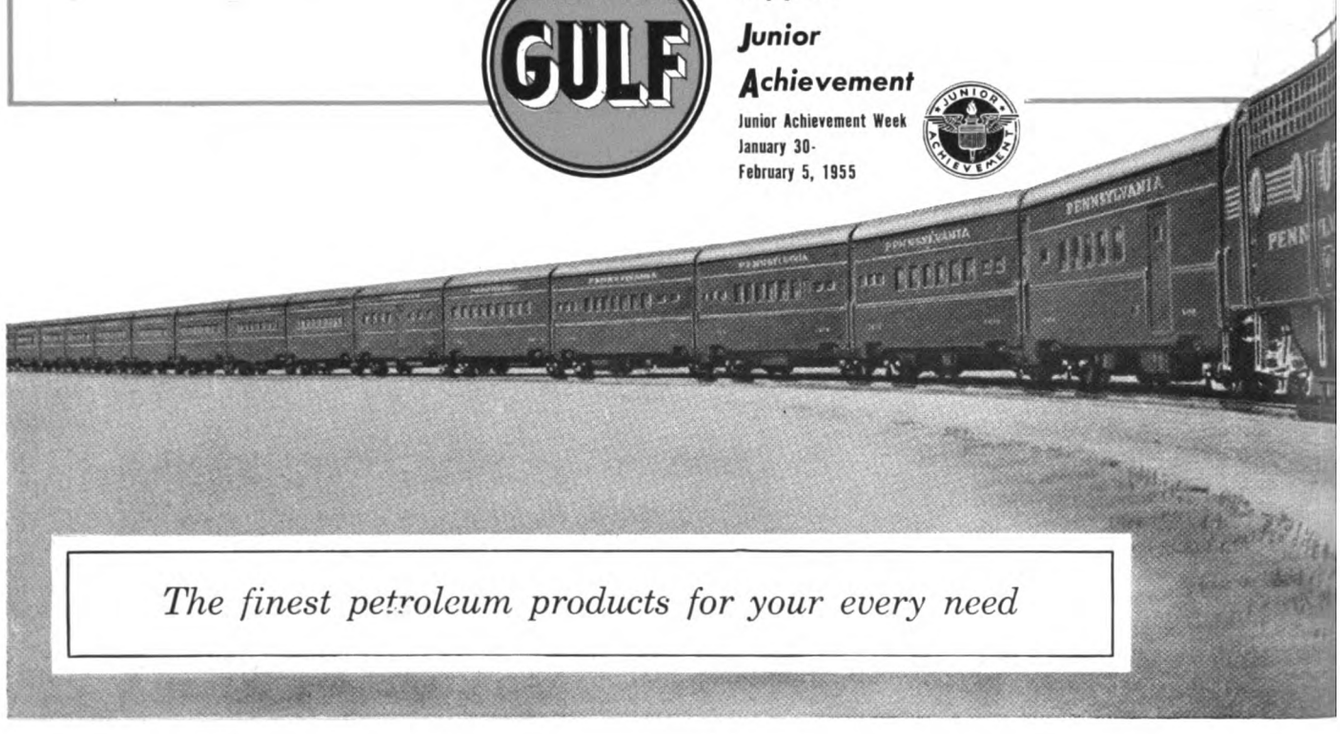
Junior
Achievement

Junior Achievement Week
January 30-
February 5, 1955



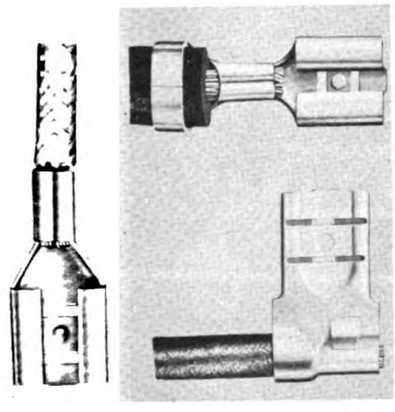
The finest petroleum products for your every need

EQUIPMENT

(*Continued from page 11*)

croammeter. It is not affected by magnetic fields.

This device operates on common hearing aid batteries. The battery voltage and calibration can be easily checked by an adjustment of the selector switches on top of the instrument. It weighs about 5 lb and its overall dimensions are 4 by 8 by 13¾ in. *Meter and Instrument Division, General Electric Company, 1 River Road, Schenectady 5, N. Y.*



Solderless Terminal Connectors

The Faston connector is a solderless push-on type that is now available in two sizes. One size fits standard ¼ in. tabs. This device can be used in industry because of its automatic application to wire, its ease of assembly and maintenance.

A smaller size has been perfected for wire sizes No. 22 to No. 18. It was designed for wire cost reduction programs on non-critical circuits.

The large insulation support connector used on wire sizes No. 16 to No. 12 handles insulation between 0.210 to 0.265 in. This termination is designed for 1/16 and 5/64 in. wall insulation. They may be obtained in strip form and may be applied with hand tools as well as automatic machine. *Aircraft-Marine Products, Inc. 2100 Paxton Street, Harrisburg, Pa.*

(*Equipment continued on page 79*)

RE-SURFACE **BOX CAR** FLOORS

in approximately 16 man-hours

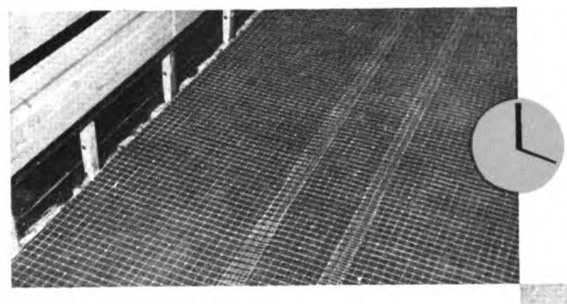
with

Plastinail*

OXYCHLORIDE CEMENT BOX CAR FLOORS

SAVES TIME, EFFORT AND MAINTENANCE DOLLARS

Easy-to-apply Plastinail provides a Class "A" replacement for worn box car decks that can stretch your maintenance dollars and upgrade your entire car pool classification for increased revenue. So easy to apply . . .

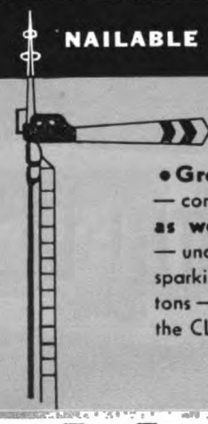


1. A 15-lb. saturated felt paper is laid over old wooden floor to act as a waterproof barrier and seal off old surface. The saturated felt prevents chemicals, oils, greases absorbed by the old deck from penetrating the re-surfacing material and thereby contaminating the lading. Average time: 1 man-hour.

2. Next, a wire key mesh is put down over the paper and nailed on 6″ centers. Large head 1½″ roofing nails are used to provide the best mechanical key possible, also serves to strengthen floor and provide a bond between the Plastinail and the old wooden deck. Average time: 8 man-hours.

3. After the above operations, the car is ready for pouring the plastic mixture. A 1″ coating of Plastinail is applied over the entire car floor, leveled to proper grade and allowed to dry. After a suitable setting period, the Plastinail is given final troweling, floor sealed and new threshold plates installed. Total time elapsed: approximately 16 manhours.

NAILABLE AS WOOD • HARD AS STONE • FOOT-SAFE SURFACE



Note these advantages

• **Greater economy** — costs less to install, maintain, clean and repair • **Stronger** — compression strength of 3,500 # p.s.i. — density equal to hard maple • **Nailable as wood** — withstands impact; deflects without cracking • **Odorless; dustless** — unaffected by heat, cold or moisture • **SAFER** — not slippery; fire-proof; non-sparking • **Smoother** — monolithic surface reduces abrasive damage to bags, cartons — seals deck, makes it ideal for bulk lading • **Double the strength,** triple the CLASS "A" service life of wood alone

*Registered Trade Name of F. E. Schundler & Co., Inc.

F. E. SCHUNDLER & CO., Inc.

504 RAILROAD STREET • JOLIET, ILLINOIS

MILLIONS OF TONS OF FREIGHT RIDES ON CLASS "A" PLASTINAIL FLOORS

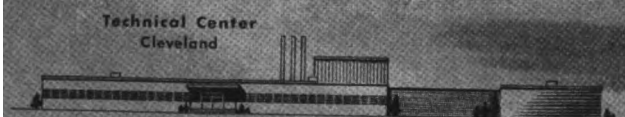
8 TIMES AROUND THE WORLD ...

FRICTION WEDGES

Because of large bearing areas, both flat and convex surfaces of the original wedges showed negligible wear at any point; wedges should last as long as the car

FRICTION MECHANISM STILL IN TOP CONDITION ...

Technical Center
Cleveland



"Progress through Research"

WEATHER CONTROL

your perishable shipments

SNOW

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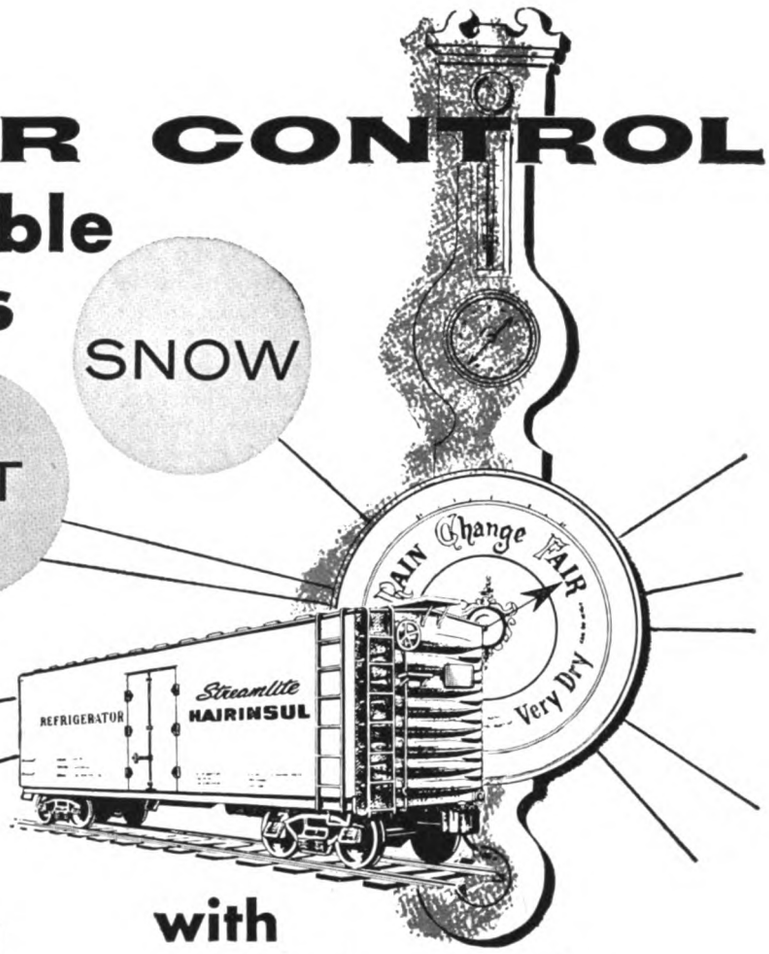
COLD



LOW CONDUCTIVITY... Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity —.25 btu per square foot, per hour, per degree F., per inch thick.

LIGHT WEIGHT... Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.

PERMANENT... Does not disintegrate when wet, resists absorption. Will not shake down, is fire-resistant and odorless.

EASY TO INSTALL... Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.

COMPLETE RANGE... STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings available.

HIGH SALVAGE VALUE... The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

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No matter how extreme or sudden the temperature change, STREAMLITE HAIRINSUL, the dependable all-hair insulation, gives maximum weather-control protection to vital shipments of perishables under all conditions.

For nearly half a century, major car builders have specified all-hair insulation because of it's greater efficiency and economy.

WHEN WEATHER PROTECTION COUNTS... you can count on STREAMLITE HAIRINSUL.

At left are still more reasons why leading refrigerator car builders insist on STREAMLITE HAIRINSUL. Complete data will be sent on request.

Streamlite AMERICAN HAIR & FELT CO. HAIRINSUL

SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

Must We Be Hobbled by the Past?

In the matter of passenger traffic the railroads are between two millstones—that of the speed of the airplane on the one hand and that of low bus fares and the availability of the family automobile on the other. The railroads are left with the one advantage of room and comfort which, unfortunately, is too expensive to attract patrons in sufficient numbers to assure a profit to the railroads.

That the railroads can ever expect to compete with the speed of air transport is inconceivable. Therefore, if they are to exploit the one important factor in which they excel, they must find means of reducing the cost of their service to their patrons—not, necessarily to the level of highway rates, but low enough so that the attractions of long-distance railway travel will effectively increase train-mile revenues.

About the only avenue left within which these changes can be effected is reduction of weight and simplification and standardization of design. The average per-passenger-seat weight of parlor and sleeping cars in service on the Class I railroads is more than three tons. So-called lightweight cars built within the last five years range from under 3,000 lb to over 6,000 lb. The average weight per coach seat of all full coaches of the Class I railroads is about 1,680 lb. A few coaches have been built during the past five years which are lighter per seat than the average, but most of them range from well over 2,000 lb—some of them close to 3,000 lb.

By complete departure from interchangeability with conventional cars and reducing the length of rigid units passenger coaches have been built with weights per seat much less than 1,000 lb. When built, the Spanish Talgo trains weighed about 500 lb per coach seat and the experimental unit of Train X, about 800 lb. The latter is a little less than half the weight of the average passenger coach seat of the Class I railroads. A similar reduction in parlor and sleeping-car seats and berths, which has actually been attained in cars of conventional type, would make it possible to reduce the tare of passenger-carrying cars by one half. Then, if dining, club, dormitory and baggage cars could be given the same treatment, the tare weight of the entire passenger train could be cut in half. This might require major simplifications of meal service, perhaps in the direction of that furnished to travelers by air, with benefits to the patron and the railroad alike.

After the expense of developing the rolling stock of the new type has been absorbed, the first cost of the entire train will be reduced about in proportion to the reduction in weight. At considerably more than $1 a pound this will amount to a capital saving of better than $800 to $3,000 per individual passenger accommodation. The necessary locomotive capacity and the passenger-train fuel consumption would be cut in proportions approaching that of the weight reduction.

These tangible savings and the possibilities that simplification and standardization of design afford for reducing maintenance are explored, among other factors, in a paper presented by T. C. Gray, vice-president, engineering, Pullman-Standard Car Manufacturing Company before the Railroad Division of the American Society of Mechanical Engineers during the annual meeting at New York on December 2. Some of Mr. Gray's proposals among them those referring to auxiliary power, will not attain general acceptance without opposition, but none of them can be dismissed without thorough consideration. In the present situation, the burden of proof rests on those who oppose the author's general approach to the needs of the future. A condensation of his paper is presented on another page in this issue.

More About Flat Cars

An editorial "What Railroads Need" in the November issue of *Railway Locomotives and Cars* discussed at some length flat car construction with particular reference to the provision of permanent end bulkheads to prevent endwise shifting loads and subsequent expense and delay in re-adjustment. Certainly, there is increasing appreciation by forward looking shippers, as well as railroad men, of the mutual benefits to be derived when loaded materials such as lumber, poles, pipe, etc., could be held against longitudinal shifting on such flat cars with never more than ordinary securement methods.

The editorial gave an erroneous impression to one reader who said that flat cars with permanent ends would not be "special purpose" cars, but really an *additional type* of flat car, which can be used for transporting all commodities now carried on conventional flat cars except single over-hanging loads and twin and triple shipments. Since multiple car shipments are said to constitute less than 5 per cent of all commodities moving on flat cars, our correspondent logically comments: "If the railroads were to start at this time to build all new flat cars with permanent ends for general use, we would still have enough cars in the existing fleet to take care of all requirements for multiple shipments for the next 25 years."

It has been suggested that the simplest way to tackle this problem would be for railroads to start building all new flat cars with permanent end bulkheads of a substantial design for general interchange service. The added cost of the permanent bulkheads, as applied to new cars, would be considerably less than when installed on existing cars. The use of this construction, eventually on almost the entire fleet of railway flat cars, would apparently be welcome to shippers in general and even more beneficial to railroads.

Special mention was made in the editorial of lumber shipment delays in transcontinental movement on account

(Continued on page 43)

EDITORIALS

of endwise shifting, and no one has so far questioned the unsatisfactory performance cited, but the point is stressed that considerable improvement has been made in preparation and handling of lumber shipments in the last few months. Appropriate committees of the AAR Mechanical Division have been working hard and faithfully with shippers to improve lumber loading, for example, and active collaboration with the West Coast Lumbermen's Association has resulted in eliminating the accidents which occurred in connection with handling lumber some years ago. The traffic manager of this association is credited to a large extent for successful efforts in working with the AAR to establish loading specifications and methods of handling lumber for the mutual benefit of the lumber and railroad industries.

With due appreciation of progress already made, why not give both railroads and shippers in general all the mechanical assistance possible in solving their joint problem by furnishing flat cars with permanent end bulkheads?

Why Passenger-Car Trucks Are Heavy

The thought has sometimes been mistakenly held that modern passenger-car trucks are heavy and frequently constitute almost one-third of the total car weight because the truck frames are in most instances made of cast steel. As a matter of fact the frame is a far smaller proportion of total truck weight than commonly appreciated and if eliminated entirely would still leave quite a heavy truck. In other words, any intensive effort to reduce truck weight must take into consideration many other factors and details besides the frames.

The weight breakdown of a typical modern four-wheel passenger car truck with 6-in. by 11-in. journals and outside swing hangers shows the following scale weights in pounds: truck castings, 6,412; axles, 1,942; 36-in. wheels, 3,580; roller bearings, 1,696; forgings, 2,339; clasp-brake gear, 3,030; springs, 1,012; side bearings, 37; snubbers, 138; Decelostat equipment, 200; speed governor, 61; miscellaneous, 145—total 20,592. This does not include the weight of the generator drive which may be as much as 700 lb and, if added, makes the grand total 21,292 lb, or over 10½ tons for a single truck.

It will be observed that while truck castings constitute the largest single item of weight they represent only 31 per cent of the total. Three items of brakes and brake equipment aggregate 3,291 lb, and thus weigh more than one-half as much as the truck castings. Similarly, forgings of various types weight 2,339 lb, or over one-third the weight of the castings. Obviously, therefore, no major saving in total truck weight can be expected without changes in design which will reduce not only the weight of castings but forgings, brake gear and other details.

Sic Transit . . . . .

The death of J. A. Andreucetti on November 29, 1954, at the age of 73, marks the passing of an era. Born in 1881, he entered railroad service in 1901 with the Illinois Central's operating department, transferring to the electrical department of the Chicago and North Western and Chicago, St. Paul, Minneapolis and Omaha in 1905. Work in this department became his life career as he advanced from electrical helper in 1905 to chief electrical engineer in 1944.

"Joe" as everybody knew him, was best known for his work with what is now the Electrical Section, A.A.R. It was in 1908 that a small group of railroad men got together, realizing that the electrical infant of that day would grow to be a giant and would indeed become a monster if his growth were not given direction. So they organized the Association of Car Lighting Engineers. Joe was one of the group and in 1910, he was made secretary-treasurer, a job he held until his retirement in 1947. The name of the Association was later changed to the Association of Railway Electrical Engineers and in 1937, it became the Electrical Section, Mechanical Division, A.A.R.

During the early days of the association, mechanical men were prone to look upon the group as a bunch of mavericks who couldn't do much harm and at times served a useful purpose. They were permitted, so to speak, to put an axle generator on a car provided that it would in no way interfere with the operation of the car.

But it was the foresight and energy of these men that was largely responsible for the application of electricity to railroads as we now know it, and the fact that they were "mavericks" who could operate independently unimpeded by the heavy hand of management permitted their doing so much. They studied, they developed, they standardized and they recommended, and railroads operate more effectively as a result, so that now in this new era when every railroad department is in large measure dependent on things electrical, there is progress with little confusion.

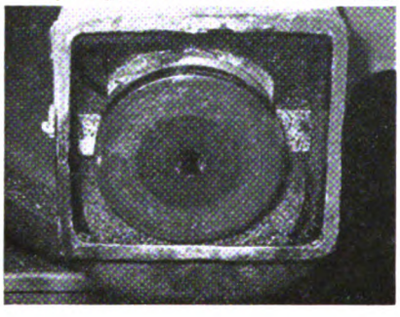
It was Joe who really held the Association together. Many times things would have fallen apart if it were not for Joe. Committee work would have lagged and many reports would never have been completed in time except for Joe's insistence. Older members of what is now the Electrical Section, Mechanical and Engineering Division, A.A.R., can remember their irritation arising from Joe's needling, but they knew he was right and they came through with their work, thanks to Joe.

In 1949, the Association awarded him the title of Secretary Emeritus. He bore this honor proudly and we who knew him well are proud to have known Joe.

Average freight car has only 1 hot box every 12 years

You can make it better than 1 in 24 Years with MAGNUS R-S JOURNAL STOPS

New development makes waste pack an efficient lubricator at the same time it reduces maintenance and servicing requirements



Pulpwood car with separable boxes and Magnus R-S Journal Stops installed. Inset shows integral cast box installation with packing in normal position after 11½ mph impact test.

Do automobiles or trucks ever run 12 years without a road failure of a bearing? Chances are they don't—especially road-haul trucks. Very often the trucks themselves don't last that long.

Well, railroad solid bearing freight cars do even better than that now—and these cars average 20 years old. In 1953, there were only 156,328 set-offs for the 2 million-odd freight cars operated over Class I railroad lines. That's only one set-off for each 12.8 cars per year—*equivalent to each car having one hot box every 12.8 years.*

How to Double This Good Record

Indications are that with the Magnus R-S Journal Stop railroads can cut the number of set-offs in half — double the car miles per hot box of any kind, and the miles per bearing too. Why? Because from 50% to 70% of all hot boxes are caused by waste, and this new low-cost device makes the conventional waste pack an efficient lubricator. First, it positively keeps the bulk packing where it belongs. Second, the bearing can't be cocked off its seat on the journal to trap lint or short strands beneath the bearing crown. And third, during braking or impacts the box can't rise to compress packing and interrupt the oil feed. Within given limits you maintain constant journal-to-packing pressures, and you get a constant feed of oil.

On one road, R-S Journal Stops have been in service for over two years. *There hasn't been a bearing replacement — much less a hot box.* And that's only half the story. To get it all, write to Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Boulevard, Chicago 4.

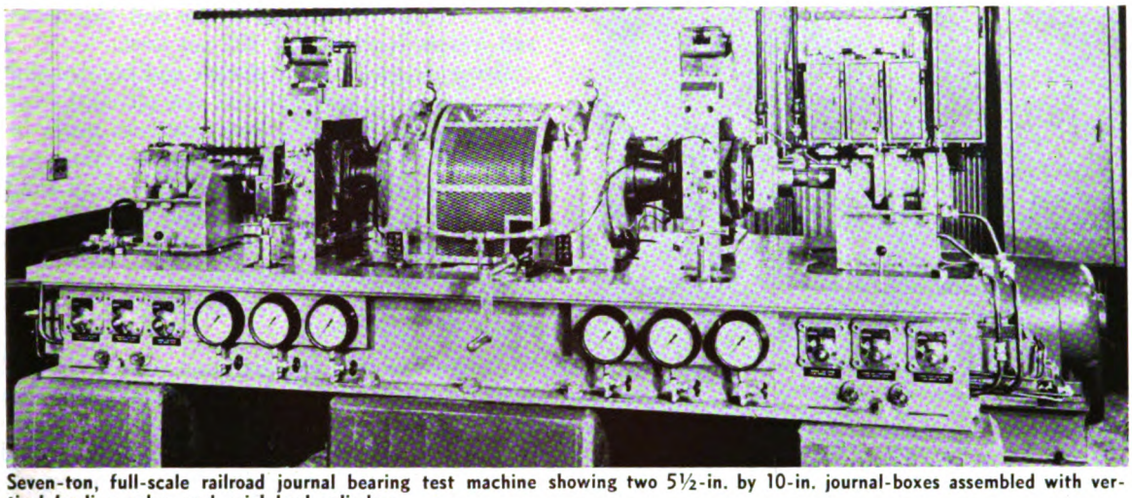
MAGNUS

Solid Bearings

Right for Railroads
...in performance...in cost

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

RAILWAY LOCOMOTIVES AND CARS



Seven-ton, full-scale railroad journal bearing test machine showing two 5½-in. by 10-in. journal-boxes assembled with vertical loading yokes and axial load cylinders.

Progress in Railroad Bearing Lubrication

By F. J. Villforth and

J. R. Muenger*

THE ENCYCLOPEDIA BRITANNICA defines a bearing as "the stationary support which carries a moving element of a machine and maintains the proper relationship of the moving element to the stationary element. A bearing usually allows the moving element perfect freedom for one form of motion, such as rotation, and at the same time prevents any other form of motion". In most bearings, the moving surfaces are separated by rollers, balls, or a lubricant film and, in general, are classified either as rolling friction or sliding friction bearings.

Since bearings are an integral part of almost every machine, proper functioning of the machine depends very materially upon the proper functioning of the bearings. In addition to the bearing design and construction, the lubricant used in the bearing plays a most significant role in the performance of the bearing and, in turn, of the machine itself.

Without a doubt, most bearings are used for support of rotating shafts or journals. On American railroads alone, there are actually millions of such bearings employed as locomotive and car journal bearings. As in other machinery, the proper functioning of this rolling stock is dependent upon bearing performance.

Railroad Bearing Research Father of Lubrication Theory

It is particularly interesting to note that the study of railroad bearing lubrication provided the stimulus for the development of the theoretical basis of hydrodynamic lubrication fundamentals. It was in 1885 that Beauchamp Tower conducted a series of experiments in England on railway bearings in which he measured the relationships between friction, loads, and lubricant type. In his test work in which he used lard, rapeseed, sperm and mineral oils, he found, quite by chance, that there was an actual fluid pressure developed within the oil film. He proceeded to find this pressure distribution experimentally.

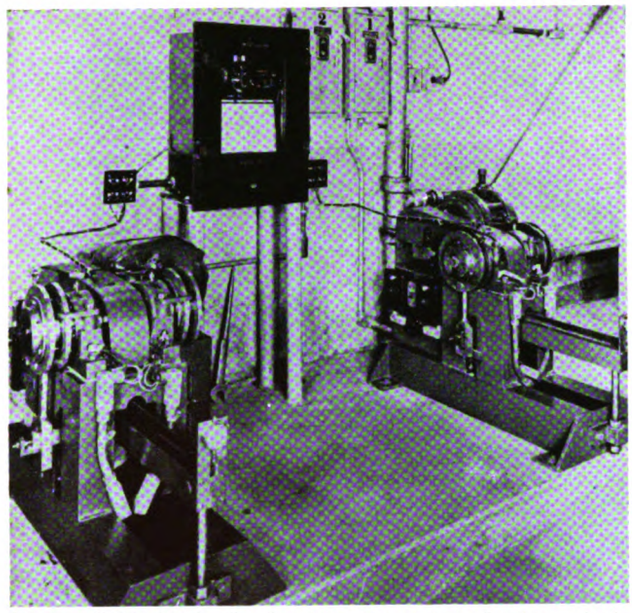
In 1886, Professor Osborne Reynolds, at the University of Manchester, clarified Tower's work in a publication of a mathematical analysis in which he laid down the principles of the basic theory of hydrodynamic lubrication as it is known today. The most significant result of Reynolds theory is the principle of the wedge-shaped or converging lubricant film. In bearing operation the lubricant adheres to the moving and stationary surfaces; and by virtue of its viscosity, a positive fluid pressure develops in the film. The pressure developed supports the load and separates the metallic surfaces.

Many additional investigators, since the days of Reynolds, have made and are continuing to make substantial contributions to the theory of lubrication pioneered by the initial work with railroad lubrication.

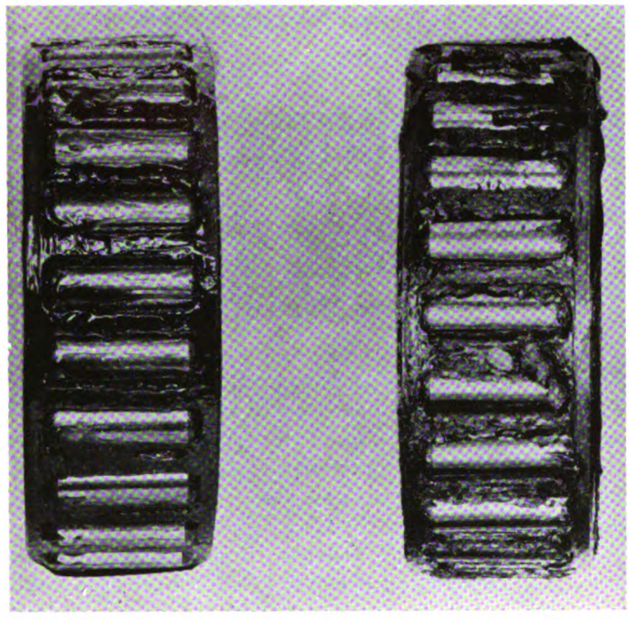
Railroad Growth

With the improvement of the steam engine in the latter part of the eighteenth century by James Watt and its application to steam locomotion in 1914 by George Stephenson, an entirely new mode of transportation was initiated which contributed materially to a great era of expansion in the United States. In 1830 the first me-

* Research and Technical Department, Texas Company, Beacon, N. Y.



These cylindrical roller-bearing testers operate under heavy loads. Bearing and Lubricant condition at completion of 500-hr runs used to predict performance of greases in service.



Two roller and cage assemblies at completion of simulated service run on railroad journal bearing test machine. Amount and condition of the grease on these bearing elements show differences in performance of Grease A (left) and Grease B (right).

chanically powered train on the American Continent was drawn by a steam locomotive built in New York. In 1869 it was possible to travel from coast to coast by rail. By 1948 the total miles of rail lines had increased from the initial 40 to 225,149 miles.

Rail Freight Increases 182 Per Cent

Although not the only factor contributing to the great industrial strides and the development of the United States from a few scattered settlements to a world power, the railroad played a very significant part. With scarcely more than 6 per cent of the world's population and 5 per cent of its land area, the United States has more than 29 per cent of the world's rail mileage. Agricultural and industrial prosperity, dependent upon mass movement of goods, has increased. In 1952 the United States produced 21.3 per cent of the world's wheat (exclusive of U.S.S.R. and China), owned 12 per cent of the cattle and produced 48 per cent of the steel. Industrial progress in other countries as well has accompanied the extension of this form of transportation and it is to be expected that the industrial developments in what are now more backward countries will follow this pattern. In this connection, it is interesting to note that in the past two decades world rail freight increased by 182 per cent.

Great progress in the design and construction of railway equipment accompanied the physical expansion of the railroads. Not only were advances made in comfort and safety to the traveler, but improvements were realized to increase efficiency and reliability of all rolling stock. This progress has made possible the utilization of the greater motive power as locomotive design advanced and trains became larger and faster.

Daily Mileage 46.5

Progress in railroad operation such as the replacement of the steam locomotive by the diesel have permitted increased trip length with less frequent stops for watering and refueling. Railroad statistics show that the daily average mileage for freight cars has increased from 27 in 1920 to 46.5 in 1950, accompanied by an increased average speed from 11.1 to 16.8 mph. Also, during this same period, the average freight-car capacity has increased from 42.4 to 52.6 tons. The figure which combines both the speed and load factors is the number of ton-miles per train hour. In freight service, this has increased three-fold in the years 1920 to 1952 when the ton-miles per train hour increased from a total of 7,303 to 22,567.

Although over the last 30 years, except for the period during World War II, there has been a steady decline in passenger travel as indicated by the passenger miles, the train speeds and the trip lengths have greatly increased. For example, in 1920 the daily average passenger locomotive mileage was 158.5 miles, while in 1952 it was 266.1 miles.

Progress has also been realized in the field of lubricants and lubrication. As a result of research and testing, improved petroleum products have been developed to keep pace with the demands and often-times open the way for equipment and performance advances.

Importance of Maintenance Costs

A very important consideration in railroad operation is the cost of equipment maintenance. As shown by the following tabulations, the cost of freight and passenger car maintenance has risen rapidly from 1940 to 1952. Increased hourly labor costs have greatly affected this expense.

In addition, the number of available maintenance hours has been drastically reduced due to fewer employes and shorter working week. Journal-box maintenance is an appreciable part of the total maintenance and, hence, is subject to these same limitations.

Importance of Lubrication Research

Both the increased operating demands and the trend in maintenance economics place a premium on continued improvements in bearing design, lubricants, and lubri-

YEARLY CAR MAINTENANCE—COST OF REPAIRS*

Year	Freight	Passenger	Ratio of car repairs to operating revenue, per cent
1940	$116	$1,782	6.09
1942	171	2,357	5.27
1944	206	3,440	5.29
1946	212	3,750	6.79
1948	256	4,768	7.34
1950	278	4,532	6.90

* Class I railroads. Statistics from "Moody's Transportation," 1953.

MAINTENANCE OF EQUIPMENT PAYROLL*

Year	No. of employees	Payroll
1940	280,719	$ 493,430,770
1942	350,347	762,740,557
1944	389,176	1,048,834,257
1946	371,150	1,104,229,042
1948	365,142	1,264,536,859
1950	348,181	1,211,043,941
1952	345,531	1,366,855,258

*Class I railroads. Statistics from "Moody's Transportation," 1953.

cation practices. It is the job of research to produce these improvements. It can be seen that even small improvements will result in large over-all benefits, in the light of the more than 1,745,778 freight and 37,359 passenger cars in service.

Railroad Journal Bearing Test Machine

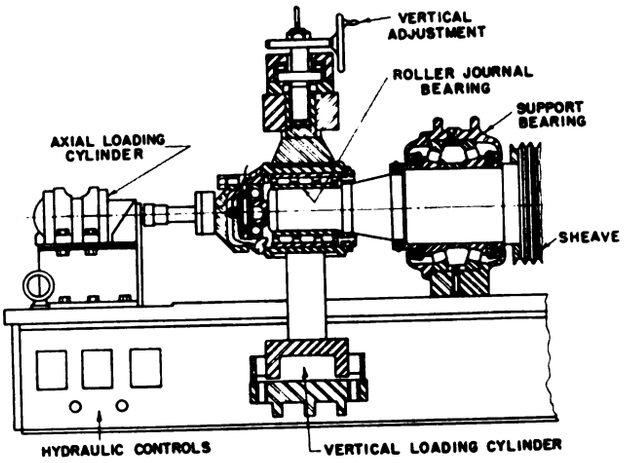
Over the many years of studying bearing lubrication and investigating lubrication problems in our laboratories for various applications, numerous test machines have been constructed and operated. Not a few of these have been specifically for studying the lubrication of railroad journal bearings. All of these tests have served the purpose of coming to a better understanding of the problems and have ultimately resulted in more and better lubricants.

The railroad journal bearing test machine is one of the significant achievements in realizing the dream of the laboratory, that is, to have a bearing test machine on which full-scale journal boxes could be subjected to the load and speed conditions encountered on the actual railroad right-of-way.

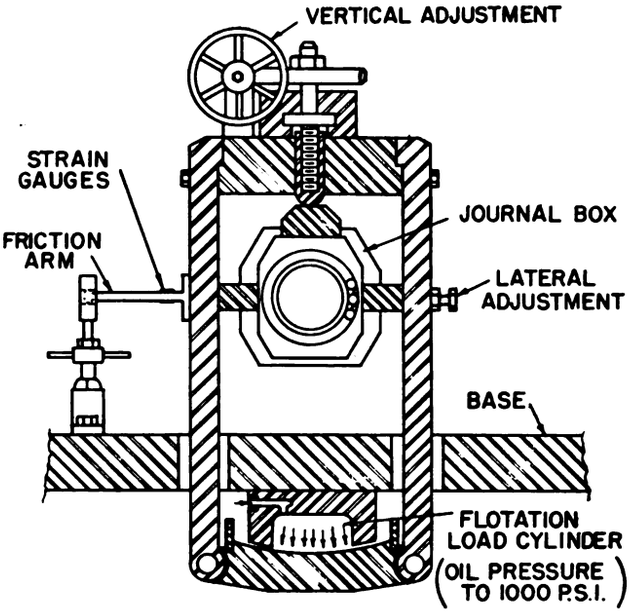
50,000 lb Maximum Loading

Steady vertical loads which correspond to the dead weight and lading of the car can be applied to the test bearings up to a maximum of 50,000 lb. In addition, vertical shock loads can be superimposed on the steady load to simulate the bearing loading experienced as a result of passing over rail partings, etc. Horizontal or axial loading, both steady and shock, duplicate the bearing loading resulting when cars are maneuvering on curves or passing crossovers. Maximum steady axial loads of 15,000 lb are possible. Shock loading frequencies may be varied up to 400 cycles per minute to correspond to the simulated speed of the car. The axial loading system provides for the relative axial motion inherent in certain types and designs of boxes. Journal rotation may be varied over the range of speeds up to the equivalent of 100 miles per hour train speed.

The machine accommodates two full size journal boxes, one at either end of the journal. The main shaft is supported on two pedestal bearings located on either side of the v-belt drive in the center of the machine. The vertical loading is applied through the loading yoke around each journal box which may be seen above the three pressure gages. The double acting piston-cylinder assemblies at each end supply the axial loading. The partial section drawing of the machine shows some of the essential internal details such as vertical and axial loading cylinders, journal, support bearing, and sheave.



One end of the test machine showing details of test box, support bearing and hydraulic loading units.

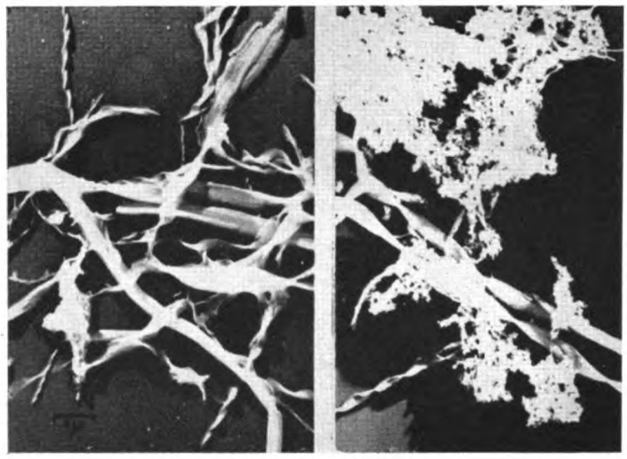


Schematic section through a roller-bearing journal box of railroad journal bearing test machine showing vertical loading yoke and flotation to permit bearing-friction measurement.

Another drawing shows a schematic section through a roller bearing test box and loading yoke. All loading is applied by hydraulic pressure up to a maximum of 1000 psi. For vertical loading, oil is supplied to the flotation load cylinder. The pressure acts against the mating loading shoe and by means of the yoke is transmitted to the top of the journal box. Vertical and horizontal adjustments permit the load to be applied exactly through the center of the bearing. By the vertical adjustment, a clearance space may be provided between the loading yoke and shoe so that the loading system floats on an oil cushion and the yoke is free to turn under bearing friction.

Rotation of the system is restrained by the friction arm which is a cantilever beam with resistance strain gages mounted on it. These measure the bearing friction.

The machine is driven from a 75 hp motor. The motor is coupled through a variable speed hydraulic coupling to a two-speed transmission which drives the main shaft of the machine through ten v-belts. Emergency safety provisions include automatic shut-down for bearing overload,



Electron micrographs of samples of roller-bearing grease. At the left, the new grease; at the right, the same grease after having completed satisfactory operation in a roller-bearing journal box.

bearing load failure, and test or support bearing overheating.

Bearing temperatures are recorded at a control panel. Bearing friction indicators, speed indicators, and electrical controls are also located on this panel. Hydraulic load system flow controls and pressure gages, indicating the bearing loads, are located on the front of the machine just below the main base plate.

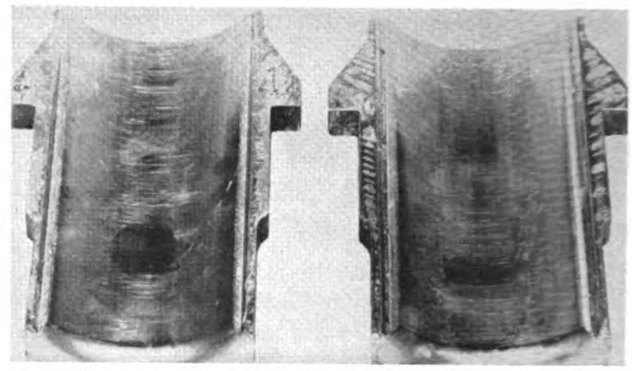
A hand crank is used in conjunction with the strain gages to locate the load accurately over the journal center before the start of a run.

Lubrication of Roller Bearing Journal Boxes

The application of roller bearings on railway rolling stock is not new; the first installations were made in the early nineteen hundreds. Although some of these early installations experienced problems, the performance of many was quite satisfactory and served to establish roller bearings as an important part of railroad operating equipment. With the increased speeds of operation and the concern for passenger comfort, it was quite natural that the roller bearing should be first applied in that type of service.

At about the same time, the application of roller bearings was made to the axles of steam locomotives, first to the trucks and later to the driving wheels. With the diesel-electric locomotive, roller bearings were used almost exclusively from the beginning. Although the application to freight rolling stock has not been very general, some cars are being equipped with roller bearings. A great deal of experimental work has been conducted by bearing manufacturers, railroads, and lubricant suppliers to explore the use of roller bearings for this service.

Roller bearings usually consist of two races, a cage, and rollers. The elements of all rolling contact bearings require careful design and accurate construction. From a first consideration it might be expected that friction losses could be almost completely eliminated in this type of bearing which esssentially places rollers between two plane surfaces. However, the action is not nearly so simple and friction losses do occur. Geometrical inaccuracies and configurations of the bearing surfaces cause some resistance to motion. Also, since no materials are perfectly rigid, deformations of the rolling members cause slipping to occur and, in turn, resistance to rolling.



These plain-bearing brasses have been subjected to typical railroad service conditions on the laboratory test machine. Wiped surface results from mild flow of babbitt to conform to journal.

The fact that roller bearings often operate for long periods of time without attention, and even with very thin coatings of lubricants on the parts, frequently leads to the erroneous conception that the roller bearing needs no lubrication or its lubrication is relatively unimportant. Also, some confusion is added to the overall picture because these bearings may operate at a higher temperature and have somewhat higher friction when lubricated.

Proper Lubricant Important

Lubrication of a roller bearing serves the following functions: (1) provides a film to lubricate the sliding contact areas between the rolling elements and their retainers; (2) provides protection for the highly finished accurately ground surfaces against rust and corrosion; (3) assists in the formation of a seal against the entrance of dirt and other foreign matter; (4) cushions the shock and distributes the load as the rolling elements enter the loaded zone; (5) aids the dissipation of heat.

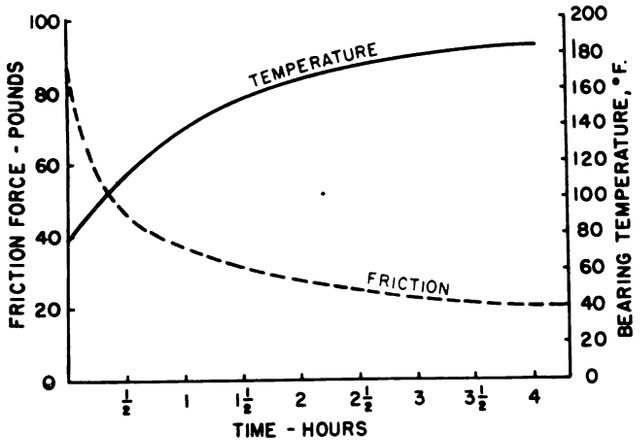
The very accurate dimensions and fine surface finishes required for the satisfactory operation of roller bearings can easily be destroyed if the proper lubricant is not used. Lubricant selection should be based upon the bearing operating conditions, i.e., speed, load and temperature.

However, such factors as bearing housing design, accessibility for relubrication, and possibilities for contamination by moisture and foreign matter have an important influence on the lubricant choice. In general, it has been the practice to use as light a lubricant as can be successfully retained in the bearing. Both car oils and greases are being used to lubricate roller bearing car boxes; however, the present tendency is toward more wide-spread use of grease. In spite of the higher cost of grease over car oil, the longer service life and less required makeup give an overall economy with respect to the grease.

Grease has the advantage over oil in serving as a better seal to prevent the entrance of foreign matter. It is also more easily retained in the journal box. In railway service, the desirable goal is to renew the lubricant only at wheel turnings and at wheel renewals.

Roller Bearing Lubrication Research

Roller bearing lubrication has been the subject of considerable research and a wealth of data has been developed to show the performance of lubricants over a wide variety of operating conditions. The railroad journal



Equilibrium bearing temperature friction curves for a grease-lubricated roller bearing from results on railroad journal bearing test machine.

bearing test machine provides another tool which extends the scope of the laboratory testing to full-scale car bearings under the conditions of dynamic loading and speed encountered in service. Test methods developed in the laboratory for the roller bearing journal boxes make possible the evaluation of oils and greases for this service under controlled and repeatable conditions. The extensive tests which have been conducted have shown excellent correlation with actual service.

By systematic variations of the grease components and evaluations in the full-scale test bearings, essential information has been developed which leads to a better understanding of the reasons why certain lubricants are more effective than others. Results have also shown the factors which influence grease performance and have given information aiding in the selection of the material to be used in grease formulations.

Laboratory Tests Reveal Temperatures

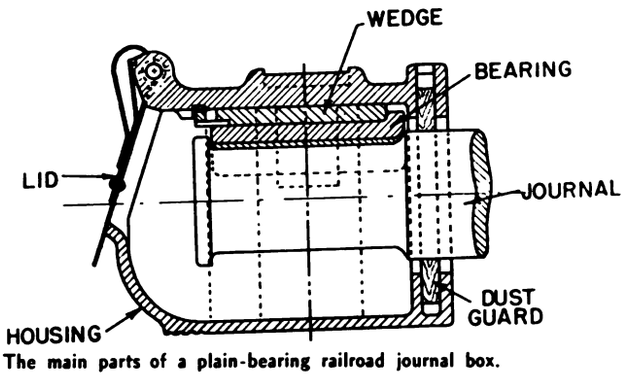
The laboratory tests have made possible the obtaining of bearing friction and temperatures in roller bearings of different manufacture and design under varying test conditions. Lubricant leakage, condition of the various bearing elements, bearing deposits, and grease changes can be evaluated. The latter can be accomplished by examining the chemical and physical condition of the grease after it has been subjected to the service-type operating conditions. The electron microscope has proved to be an invaluable tool in coming to a better understanding of the performance of greases. Information has been obtained on the influence of bearing operating variables on changes in grease structures. Also, the effects of composition and manufacturing processes on grease structure have been studied so that greases can be better designed to have specific characteristics.

Friction and Temperature Are Important

Bearing frictions and equilibrium temperatures afford one means of studying the effect of oil viscosity, lubricant quantity, and rotational speed in the bearing operation. These same criteria may be used to determine optimum grease charge for the bearing and the resistance to channeling and working.

Lubrication of Plain Journal Boxes

In spite of the replacement of plain bearings on passenger, locomotive, and some freight service, it is estimated that there are more than 14,000,000 solid type journal boxes on freight cars alone on the American railroads. The plain bearing assembly, as generally employed, is of relatively simple construction. The internal parts are the bearing, journal, and wedge. The box provides the housing, closed at one end with a lid and at the other with a dust guard.



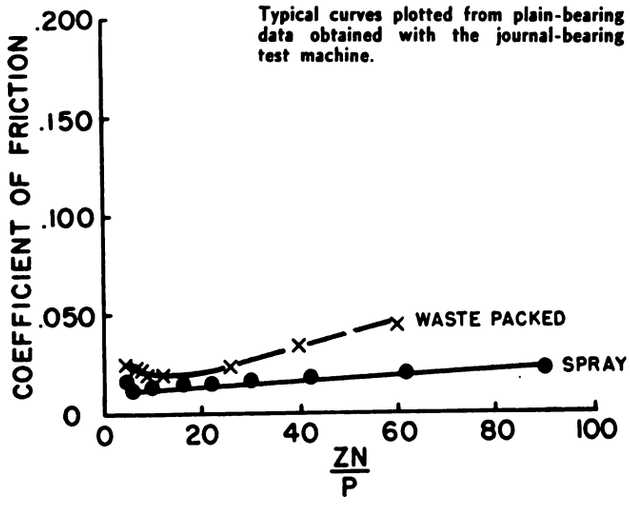
The main parts of a plain-bearing railroad journal box.

The bearings, in general, are fabricated as cylindrical segments of different material than the axle or journal with which it is to operate. A common bearing material is brass with a babbitt lining which provides comformability with the journal. The wedge serves to distribute the load and to seat the bearing properly.

In most installations, oil is fed to the journal from the oil reservoir in the bottom of the journal box by capillary action of a packing which most commonly is cotton waste. In some cases, packing retainers are used to help maintain the waste in position during switching and "humping" operations. "Humping" is the procedure used in the classification yards to assemble cars into a train. In the operation, the cars are pushed by a locomotive to a raised section of track called a "hump" from which the car then coasts by gravity through a switch to the particular track on which the train is being made up. The impact upon contact with the other cars on the train causes relative motion between journal and bearing and waste dislodgement.

When operating with a sufficient supply of lubricant, the bearing will be completely separated from the journal by a wedge-shaped, load-supporting oil film. Under such conditions, the bearing friction is due mainly to the fluid friction resulting from the viscosity of the oil in the clearance space. Due to the frictional heat developed, bearings operate at temperatures higher than the ambient. This frictional heat dissipates into the journal and bearing, and the greater the friction, the greater the differential between the bearing and the ambient temperature. To a considerable degree, this temperature rise indicates the lubrication efficiency.

When more heat is generated in a journal box than can be dissipated, a bearing failure ultimately results. In the waste packed bearing, the friction of the packing against the journal as well as the oil film friction is a source of heat. The packing friction and also the feeding or wicking of the oil are functions of the type and size of the threads in the packing and the oil viscosity. By varying these, it is possible to exert some control over the packing friction. Low viscosity oils are reported to produce less packing friction, carry less lint and foreign matter to the bearing, and feed more oil to the journal.



Typical curves plotted from plain-bearing data obtained with the journal-bearing test machine.

The failure of the bearing to function properly results in overheating which in railroad circles has become known as a "hot box". The occurrence of a "hot box" is serious because it requires setting out the car from the train for bearing repair or replacement. Since this causes delays in schedules, it can be costly. Car miles per "hot-box" set-off vary considerably depending on the season and the particular railroad involved. Some roads have a disporportionate number of "hot boxes" because of contaminating materials being handled, short haul traffic, or some other peculiar condition. If "hot boxes" are not detected sufficiently early they can lead to more serious damage to the bearing and axle and even result in train accidents.

The incidence of "hot boxes" is very closely related to seasonal variations in temperature particularly during extreme temperature conditions. The lower viscosities resulting from the hot weather probably affect the bearing to reduce the minimum film thicknesses. In low temperatures the tendency for waste roll and grab is much greater because of the increased viscosity of the oil.

Also, with increased oil viscosity the feeding or wicking of the oils is much reduced.

The occurrence of "hot boxes" following closely after the repacking of journal boxes and the installation of new brasses has been observed. If distress is going to occur from this source, experience has shown that it most often happens within a few miles or a short time after leaving the terminal.

Some shifting of waste usually will occur during "humping" as well as during normal operation of a car. This may cause the journal to pick up waste threads and carry them into the clearance space where they cause localized high friction and hot spots which further develop into general bearing overheating. In more severe cases a very substantial portion of the dislodged waste may be caught between the journal and the brass. Under some conditions, waste settling occurs to the extent that the packing loses contact with the journal and no feeding of oil to the bearing is possible. Because of poor or improperly seated seals, foreign matter such as dirt, snow, rain and other undesirable materials find their way into the journal boxes where they contaminate the lubricant and may cause changes in its properties.

Inspection and preventive maintenance have become more difficult since present day trains are assembled and depart much more rapidly. The less frequent and shorter stops of the modern train do not provide sufficient time or occasion for as thorough inspections and servicing as had been customary in the past. Much more rapid interchanging of cars and shorter periods of time in which the cars are on the same road are also making maintenance programs difficult to schedule. As previously mentioned, the cost of maintenance has increased primarily because of higher labor costs. Also, the personnel available for inspection and servicing has decreased.

Bearing Wear-in Not Gradual

With the rapid accelerations now possible with the high powered diesel-electric, bearing wear-in periods are not as gradual and there is less time for the bearing to make adjustments for abnormal conditions. Also with rapid acceleration there may be insufficient time for the establishment of an adequate lubricant film. Consequently, under these conditions high friction will occur and high temperatures will develop.

Because of the constantly increasing maintenance costs and the continued interest in improving railroad service and effecting economies in operation, a much greater emphasis is being given to the subject of "hot boxes".

Bearing manufacturers, railroads and lubricant suppliers are studying the problem and making concerted efforts to achieve a satisfactory solution. Progress has been realized in all fields of endeavor. Improvements have been made in bearing materials, in bearing design, and in the finishing and dimensioning of the various elements. Concern for the type of packing has led to better selection of the material used in the waste as well as improved methods for handling and reclaiming it.

Designs have been suggested which substitute other types of oilers for that commonly used. Various mechanical devices such as waste retainers have been devised to overcome the shortcomings of waste packings. Several rather radically new bearing designs, at least for railway service, which provide much more accurate fitting of journal and bearing with more positive lubricant supply mechanisms are being suggested. A number of these are under test either in laboratories or on the roads. It is inevitable that some of these will result in improvements in the reliability of this already tried and proven mechanism.

Plain Bearing Lubrication Research

Research work at our laboratories has been continued to further extend and apply the fundamentals of hydrodynamic lubrication to plain bearing studies in general. Special emphasis has been directed toward the study of the lubrication of the solid-type railroad journal box and its specific problems. Basic studies have been conducted to determine the effects of oil viscosity, journal speed and load, bearing dimensions (such as clearance and length to diameter ratio), and oil flow on the performance of bearings as measured by bearing friction, bearing and journal temperatures, lubricant film thickness, journal eccentricity, bearing arc, and film pressure

distribution. Complete bearing performance data, including the film thickness measurements, have been obtained over a wide range of operating conditions with numerous types of lubricants.

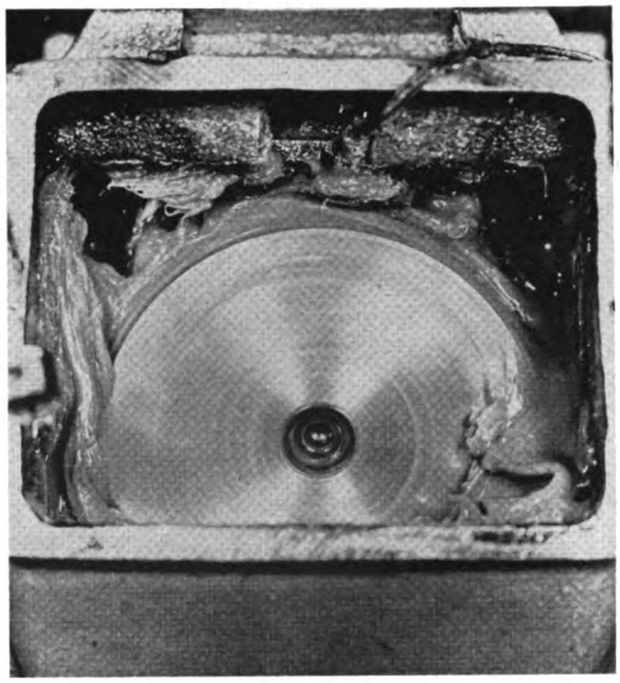
To further enhance the understanding of these very complex lubrication phenomena, transparent bearings have been specially constructed so that under actual bearing operation the formation of the fluid films could be observed visually. By means of high speed photographic techniques the phenomena were recorded for detailed analysis and study. By the introduction of colored dyes into the lubricant films and then observing the distribution of the dye throughout the film, a much clearer understanding of the circulation of lubricants within the film was developed. Differences between the behavior of various types of lubricants in this respect were marked.

Plain bearing studies on the full-scale railroad journal test machine are also possible since this tester had been designed to accommodate all types and makes of railroad bearings in the sizes from 5½ by 10 in. through 6½ by 12 in. The shaft for the plain bearing studies had been designed so that the test journal sections were identical to the car axle ends as specified by AAR. To eliminate any possible influence from variations in the waste packing and the packing procedures on the oil performance studies, some testing was conducted in which a special oil spray and circulation was provided. Oil picked up by a pump from the journal box reservoir was sprayed against the journal through a series of orifices located axially along the journal below the brass. Heat exchangers in the system provided a means for control of oil temperature by either cooling or heating.

The effects of oil viscosity on bearing temperature and friction have been determined and studies conducted to show the influence of speed, load, and viscosity on the bearing performance, particularly in the operating zone where full hydrodynamic conditions might be giving way to boundary lubrication conditions. This operation is not unlike the starting, stopping, or low speed service on the railroads. By examination of the wear pattern on the bearing surface which has been run under such conditions, particularly when some wiping occurs, it is possible to deduce the causes and effects. Influences of various bearing materials and oils and EP additives in the oils on the performance under such conditions are studied. The effect of break-in or run-in procedure on a new bearing has been found to be quite important relative to the load carrying ability without overheating.

Evaluations have also been made using waste packing in the journal box to determine the effects of oil viscosity on the friction and running temperature of the bearing. Under operating conditions with flooded lubrication as furnished by the spray system, bearing frictions and operating temperatures were lower than when the lubrication was supplied from the waste packing. This was due not only to more satisfactory lubrication of the bearing but also to elimination of the friction which results from the waste contacting the journal.

Studies have also been made by means of special bench tests to determine the effect of lubricant viscosity, thread quality, and type on the wicking or capillarity of the waste packing. The tests designed to evaluate this property, independently of the bearing, show that there are marked differences in oils and wastes in this respect.



This plain-bearing journal box is being run in the laboratory under load with grease lubrication. Considerable circulation of the grease to the bearing can be seen as a result of axle rotation.

String grabbing tendencies of car oils have been evaluated both at high and low ambient temperature conditions in full-scale bearing test stands.

Grease Lubrication of Plain Bearings

Many investigators concerned with the "hot box" problem consider that the elimination of the waste packing is essential to a completely satisfactory and reliable plain bearing for railroad service. In the past several years this approach has been evidenced by numerous papers published in technical journals and presented to technical societies. The rather fundamental studies which were conducted on the previously mentioned bearing test machines with grease as a lubricant, suggested the feasibility of grease for the lubrication of plain journal boxes. In particular, these studies showed that a hydrodynamic load supporting film was developed with grease in much the same way as for a fluid type lubricant and the coefficients of friction were of the same order of magnitude.

Observations of the flow of grease in a plain bearing indicated that grease exhibits somewhat directional flow properties. This was indicated in the bearing by the relatively low resistance to flow in the direction of journal rotation while in the axial direction there was resistance to flow in that end leakage was low.

Experimental Principles Applied

The principles observed in the experimental bearing have been applied to the full size car journal box on the railroad journal bearing tester. Grease was charged in the box to a level sufficient for the journal to dip into and pick up grease and carry it into the clearance space. The investigations which are continuing, show the influence of grease fluidity on the circulation of the grease in the box. Experimental work shows some of the factors,

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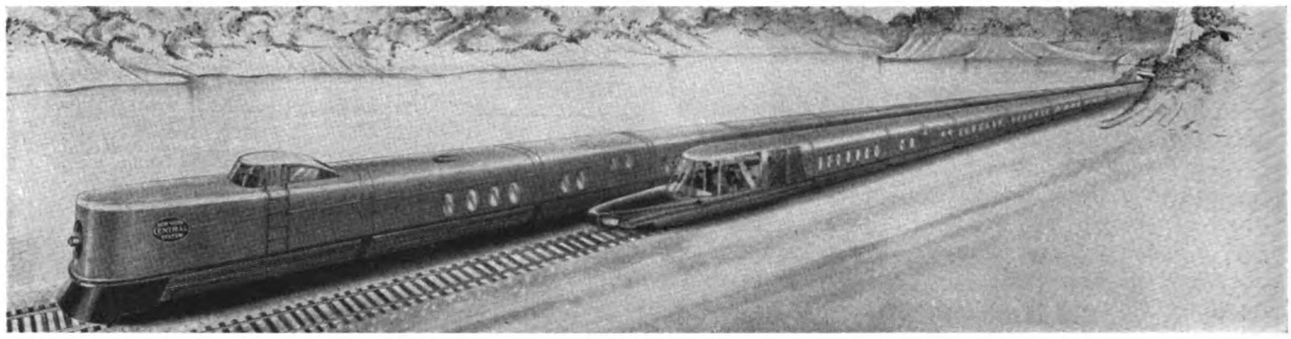


Train X coming and going.

Realistic Goals in

Railway Passenger-Car Design*

- **New lightweight construction**
- **Central auxiliary power supply**
- **Standardized modules or units**

By Thomas C. Gray

RAIL TRANSPORT of passengers is and will continue to be a vital and necessary part of our economy. Related problems, many and knotty though they be, are capable of solution. A reasonable measure of success in meeting and solving these problems should produce profitable passenger operation for the railroad industry. Leaving the problem of rates, public relations, services, schedules, etc., to experts in those fields—is there one wherein the car builder figures prominently? This question was well answered in an editorial appearing in "Railway Age" which states in part:

"The basic difficulty in the carriage of passengers by rail today is that it costs too much—for the railroads. Surely the gap is not to be found in 'profits' of the passenger-car builders. People don't consider abandoning a business which provides substantial profits. The real key is that the railroads are trying to fight mass-produced automobiles and buses—even air transports—with custom-built equipment purchased generally in small lots, and in erratic 'peaks and valleys,' to individual road specifications. The buyers demand weight and strength factors completely out of proportion with other forms of transportation."

What sort of world would we have today with an average automobile age of 25 years or even 10 years? We would not be tending to go out of date. We would be out of date. Isn't conventional passenger car design headed toward obsolescence?

As of January 1, 1954, only 7.75 per cent of all passenger train cars owned or leased by Class I railroads and the Pullman Company were between 1 and 5 years old, while 62.8 per cent were over 25 years old. The average age of all passenger train cars was 28.9 years. Obsolescence may well be closely related to the approximate sixty million dollar reduction in coach and the near fourteen million dollar reduction in parlor and sleeping car revenue between 1947 and 1952.

No one is in a better position to appreciate the full significance of the present passenger-car problem than the nation's car builders. To illustrate, let me quote a few statistics.

In the period 1945 through 1953, Pullman-Standard built 1,235 domestic non-sleeper passenger train cars from 151 different floor plans for 41 different customers: 43 per cent of these had less than three and 73.5 per cent had less than seven cars per plan. In this same period, we built 913 domestic sleeping cars, excluding troop sleepers, from 66 different floor plans and for 36 different railroads. Of these 21 per cent had less than three, and 42.5 per cent less than seven cars per plan.

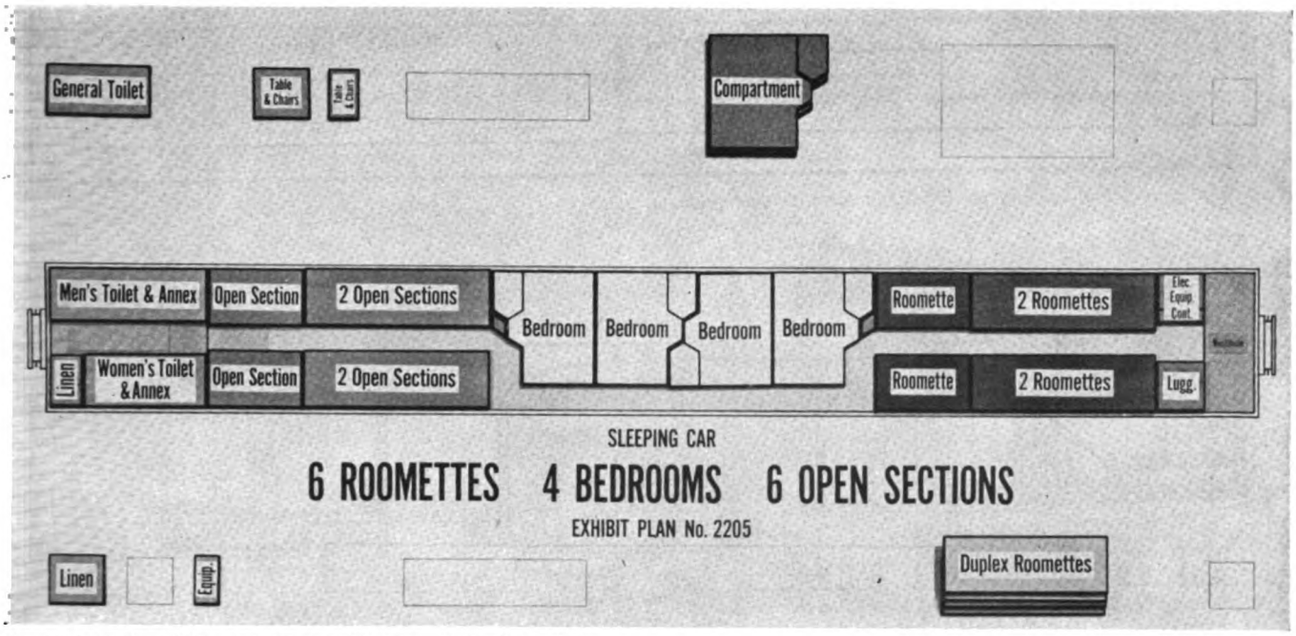
A $50 Million Penalty

The entire car building industry during the postwar (through 1953) period built 4,275 domestic passenger and sleeping cars, excluding troop cars. A conservative penalty of $12,000 per car, as a result of "custom building" dictated by railroad individual preferences, defines a penalty of more than fifty million dollars in first cost alone—and this is just the beginning.

Use of special, inconsistent designs and items of equipment has cost the railroads many more dollars in expanded inventory, added maintenance, and alteration work to correct service produced difficulties not previously anticipated.

Many steps can be taken to make the carriage of pas-

* Abstract of a paper presented at the annual meeting of the ASME Railroad Division in New York, December 2. Mr. Gray is vice-president, engineering, Pullman-Standard Car Manufacturing Company, Chicago.



Pre-engineered modules or units assembled in a basic floor plan.

sengers less costly. For instance, it is difficult for us in the car building industry to comprehend the receipt of inquiries from railroads with such divergence in specifications and yet for near alike utility and for a very few cars in each inquiry. Why can't they get together and take advantage of at least prorating the costly engineering? Standardization is certainly a partial solution.

In 1948, a number of railroad presidents indicated their interest in standardization. The American Railway Car Institute has taken active interest in this worth-while project and has made considerable "paper" progress. Nineteen floor plans covering all types of nonsleeping cars were approved by the AAR in 1950. In 1952 agreement was reached on six basic sleeping-car plans which will shortly be resubmitted to the AAR for final action.

Module or Unit Construction

In addition to taking active part in the A.R.C.I. standardization program, Pullman-Standard is designing on the "module" principle to allow flexibility in plan arrangement. Basic sleeping rooms are engineered as units together with electric lockers, general toilets, air-conditioning installations, linen-equipment lockers, etc., and six basic floor plans are available into which these individual units may be so arranged as to meet railroad requirements. Pullman-Standard also is concentrating on component interchangeability between primary assemblies thus helping to simplify customer inventory.

A modern conventional coach weight closely approaches a ton per passenger with an approximate cost of $2,000 per passenger. Transcontinental coaches and sleeping cars plus the locomotive, in a luxury-type train, when averaged with other needed cars in the consist, will more than double these figures. It would appear that weight and cost ratios should be brought more in line with that of automobile, bus, and airplane competitors if passenger business is to survive. There are always problems to be solved when new and divergent designs are adopted, but *these can be overcome if the desire for progress is real and compelling.*

ADVANTAGES OF CENTRAL POWER SYSTEM

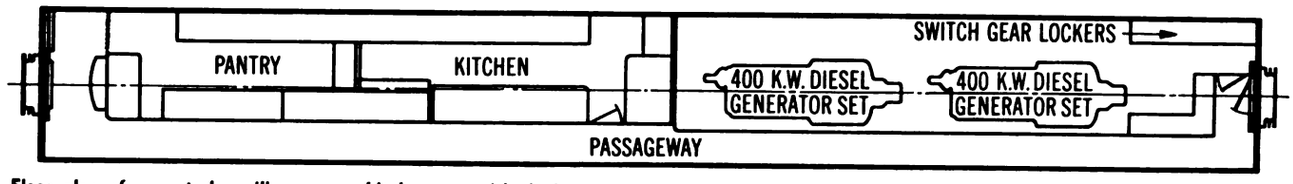
One main power source to service and inspect
Power source located in a protected enclosure
Lower inventories of spare parts
Lower replacement costs
Elimination of large storage batteries
Sealed unit compressors
Brushless motors with sealed pre-greased bearings
No power conversion units for fluorescent lighting, radio, or entertainment systems.

Lighter Materials

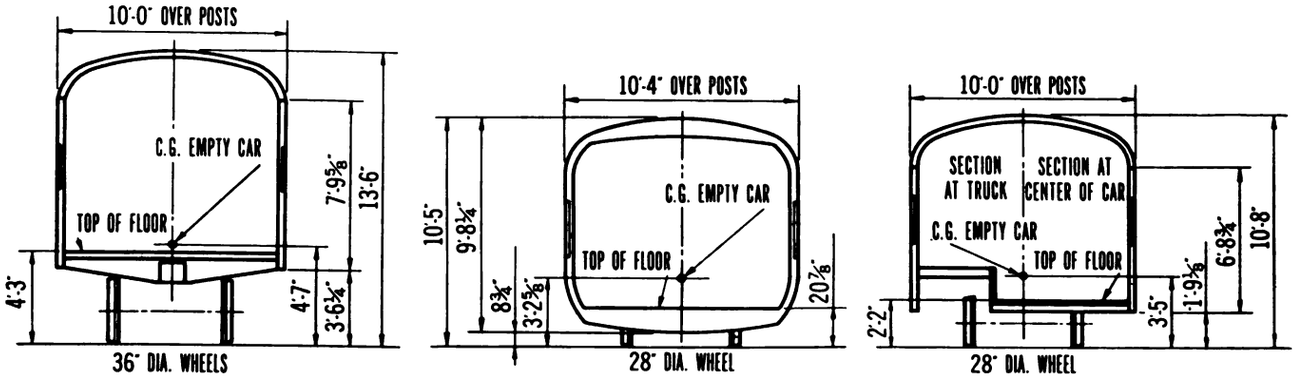
The use of lighter materials is near mandatory for minimum weight. Aluminum alloys have been used extensively in the construction of railroad passenger cars but their use in structural members has been limited. Interest in the higher strength-weight ratio together with the development of new magnesium aluminum alloys which lend themselves to fabrication by welding, should stimulate considerable interest in these lighter materials for passenger cars.

Aluminum alloy 61S-T6 offers good corrosion resistance, ductility and weldability, and appears to be highly desirable as a structural material for railroad passenger cars. Past railroad experience with the higher strength copper bearing aluminum alloys has admittedly met with disappointment regarding corrosion resistance. 61S-T6 aluminum has been used structurally in transportation equipment such as street cars, tank cars, and hopper cars for many years and its over-all utility has been proven.

The present AAR rule states "that any structural material in which the yield strength exceeds 80 per cent of the tensile strength shall not be used." This rule is intended to insure ductility in structural alloys. However, this restriction, though generally applicable is not appropriate for 61S-T6 aluminum and by making this comply, a great sacrifice in yield strength is necessary and the elongation which is considered by many to be a criterion



Floor plan of a central auxiliary power-kitchen car with dual generator sets.



Cross-sections of conventional car (left), Train X car (center), and Train Z car (right).

of ductility remains the same. Therefore, in the minds of experts, the previously referred to rule should be amended to permit the full utilization of such alloys without impairing other desirable properties.

With no restrictions on nickel, the same stainless steels that have been used effectively in the past dominate this type of construction. Government restrictions in the past prompted the use and development of chromium-manganese type stainless steel with only 1 per cent nickel. The shortage of nickel keeps a modified version of this alloy with somewhat higher nickel content very much in the picture, and this may well become an alternate grade in the event of further nickel restrictions.

Rigidity is always a problem when considering the use of high-strength stainless steel and is often the limiting factor in trying to attain great strength with minimum thickness.

The use of plastics is becoming more prominent in railroad passenger cars despite material costs, largely because of reduced maintenance. Foamed non-metallic materials such as plastics and rubbers, made into formed sections, import corrosion protection, insulating properties, rigidity and strength, and cannot be overlooked.

Central Power Supply

Conventional passenger cars are built with electrical systems of 32, 64, 110-volts dc; 110 and 220 ac and various combinations of these voltages. Much special equipment with many maintenance "stations" and with excessive weight and cost is applied. With respect to reduction in weight and cost of conventional cars, great potential return lies in the use of central auxiliary power.

Differences in electrical systems not only affect initial operating and maintenance costs but represent a most effective barrier to standardization and easy interchange of passenger cars between roads. A standard electrical system is required which is economical to buy, install, and operate—equipment that is produced in large quantities for widespread use in industry, is economical to operate, and offers little installation difficulty.

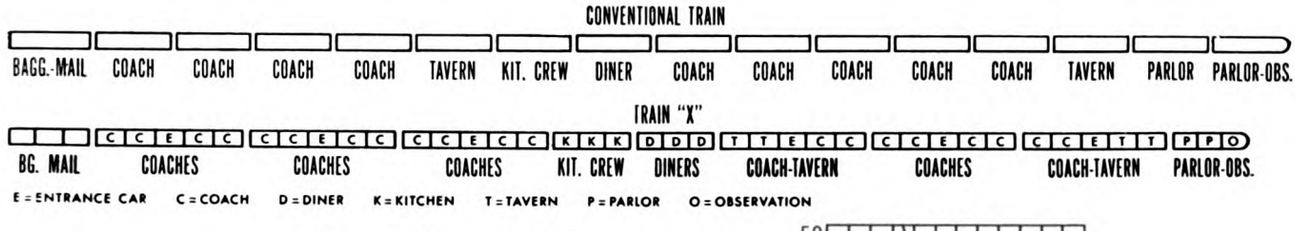
The most economical and desirable source of electrical power for a train would be a generator voltage of 440 volts, three-phase, 60-cycle alternating current. This power source would occupy a portion of a car with the remaining portion of the car used as dormitory, kitchen, baggage, baggage-mail, coach, or as desired. The car would be centrally located in a train with the auxiliary plant feeding power both fore and aft. Each power car would carry two 440-kw Diesel-driven alternators if electric heating is included. The floor plan of a central auxiliary power car is illustrated.

The electrical equipment normal to a 64-volt dc convention car could be eliminated with the central auxiliary power system. This is a saving of 13,150 lb in the car, 700 lb in the truck and addition of 2,150 lb for central power, or a net saving of nearly six tons per car. On a 16-car luxury coach train, the total saving is about 50 tons.

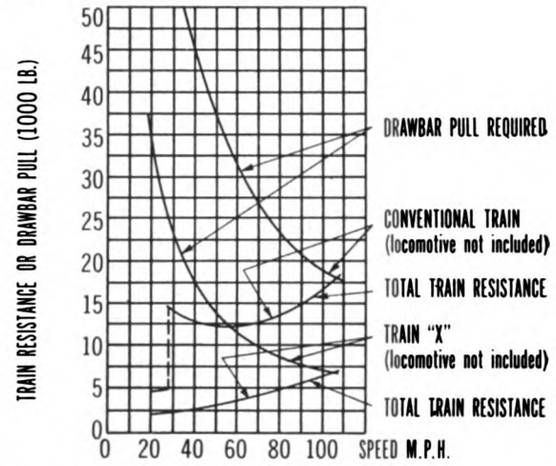
It is of interest to compare a conventional 16-coach luxury train with one having the same consist, but using a central auxiliary power car and with a lighter construction 85-ft-length car. A saving in train weight of 172 tons is possible. Weight per passenger has decreased 620 pounds. Train resistance of the conventional at 100 mph is 1.3 times as much, and at 50 mph is twice that of the lightweight train. Drawbar horsepower of 5,000 must be available for the conventional train to allow operation to 100 mph whereas 4,000 drawbar hp is sufficient for the lightweight near conventional train.

Here conservatively, there should be more than $300,000 first-cost saving on the lightweight train (cars only) over the conventional. Electrical equipment maintenance will be more than halved. The location of the power units in the center of the train, in addition to being placed more efficiently for transmission and train-line size, permits the use of conventional cars in centrally-powered trains.

The effect on train resistance and drawbar pull of producing electric power by axle-driven generators can be clearly seen by referring to related resistance curves. The difference between these curves is practically all due to resistance of the generator and drive.



	CONVENTIONAL TRAIN	TRAIN "X"
CAR LENGTH	85'-0"	31'-2½"
COUPLER HEIGHT	2'-10½"	13½"
TRAIN LENGTH	1360'	1311'
LENGTH PER PASSENGER (FEET)	2.48'	2.22'
TRAIN WEIGHT LOADED (TONS)	1188	512
WEIGHT PER PASSENGER (LBS.)	4160	1566
NUMBER OF PASSENGERS	548	588
HEIGHT—C.G. ABOVE RAIL (INCHES)	55"	38⅝"
WHEEL DIAMETER	36"	28"
HEIGHT OF FLOOR	4'-3"	20⅞"
OVERALL HEIGHT OF CAR	13'-6"	10'-5"
NUMBER OF AXLES	64	42
WIDTH OVER POSTS	10'-0"	10'-4"



Comparison of principal weights and dimensions of a conventional passenger train and Train X.

Train "X" Possible Solution

The author believes that the ultimate solution lies only in complete train redesign. This design approach is typified by Train "X," wherein the design concept of power units (propulsion and auxiliary) and cars differ greatly from conventional. The specially-designed low center of gravity, small cross section and streamlined locomotive, illustrated, is in reality a power unit in which is contained not only the propulsion, but all of the auxiliary power potential as well. An attractive modern design observation car is shown as the trailing car on the near train.

Train "X" was fostered by K. A. Browne, director of research, C&O. Pullman-Standard has collaborated in research and development of this interesting project, and in 1950 produced some experimental cars, including a transition car. Extensive mock-up and test work has been conducted by both Pullman-Standard and the C&O with satisfactory road testing at speeds in excess of 110 mph.

Mr. Browne early recognized the potential savings and improvements in first cost, weight, operation, and maintenance by realistic lightweight design. He realized that we must get away from custom-built equipment. To obtain minimum weight, we must get all of the heavy customized equipment off the car and in some way centralize the potential of this auxiliary demand. He appreciated early the desirable economic use of the presently wasted heat from the propulsion and from the needed auxiliary front end engine. Car units which can be taken from or added to the consist more easily than at present are essential. These units will have a single axle on one end with the car supported by the car ahead except when uncoupled. When uncoupled, the front end will be supported by retractable dolly wheels, the control of which is interlocked with the automatic coupler. Dolly wheels will be used for switching the car alone. The design must meet all AAR requirements and the car must be operable in either direction. These brief requirements are highly pertinent and representative of the vision of Mr. Browne.

Pullman-Standard's work has progressed to the point that the above basic requirements are now considered realistic. We expect to closely approach a car train weight ratio (Train "X" to conventional) improvement in the range of three to one.

One chart compares Train "X" with a conventional train. Both are coach trains; both have luxury accommodations and are essentially of the same floor space and accommodations with respect to comfort. The conventional train has modern air-conditioned cars with stainless steel super-structure and high-tensile low-alloy steel underframes. Four wheel trucks are provided. Train "X" cars have the basic features as prescribed by Mr. Browne. Related resistance-speed and drawbar pull speed curves are shown with resistance as computed by a modified Davis formula. Cars were considered to be units of 93 ft. 7½ in. length with three axles and weights shown are high. All curves are for level tangent track operation and with fully loaded trains. Resistance shown is that for the total train only (locomotive not included). The drawbar pull is that required for train operation to 100 mph balancing speed.

From the apparent efficient utilization of floor space, it might appear desirable to utilize a long or 85-ft car, but Train "Z" made up of such cars can not approach the potential saving made with Train "X."

Train "Z" is a low center of gravity, 28 in. diameter wheel, 85 ft car length train. Our study and comparison with Train "X" was based upon near identical train weights (cars only). Train "Z" utilizes some of the desirable features of Train "X." However, two four-wheel trucks modified to obtain maximum benefit from the lower center of gravity are used. The conventional center sill construction has been eliminated and replaced with suitable side structural members. Wheel wells are provided above the trucks thus allowing a 41 in. center of gravity height above the rail. Couplers, draft gear and

(Continued on page 60)

N&W Tests Turbine Locomotive

Full-scale dynamometer tests point to bright future for coal-burning steam-turbine-electric locomotive.

By I. N. Moseley*

EXTENSIVE ROAD TESTING of the Norfolk & Western's experimental steam-turbine-electric locomotive was undertaken (1) to verify the drawbar pull curve set forth by the builders in the locomotive specifications and to establish tonnage ratings for the new locomotives; (2) to develop the operating costs of the locomotive in comparison with other locomotives, and (3) to gain experience and data that would lead to simplification and improved performance of future locomotives of this type.

The locomotive was shipped to the railroad for road testing from the Baldwin-Lima-Hamilton Corporation's plant in Philadelphia on May 19, 1954. It was displayed at the Southern Appalachian Industrial Exhibit at Bluefield, W. Va., on May 26, 27 and 28 before being placed in service between Roanoke, Va., on June 1 for preliminary shake-down runs. During these preliminary runs the locomotive made approximately a round trip daily, a total of 200 miles.

Full-scale dynamometer tests were begun on July 19 and completed on October 2, 1954. The N&W dynamometer car was used in all tests to record drawbar pull, dynamic braking effort, speed, time, location and distance. Temporary plates were placed over the stoker trough in the coal bunker and all the coal burned was dumped from

* Research and test engineer, N&W. This paper was presented at a joint session of the Railroad and Fuels Divisions, American Society of Mechanical Engineers, New York, December 2, 1954.

a weighing bucket into an exposed section of the trough in the operator's cab. The coal, which was double-screened 2-in. by ¼-in. high volatile, was weighed in 200-lb increments, using a balance scale. Representative coal samples were taken during each test and a proximate analysis was run on each sample. The water consumption of the locomotive was measured with the aid of calibration boards at the four corners of the main tender and the auxiliary tender. The auxiliary tender, having a capacity of 16,000 gal, was employed to eliminate water stops between terminals. This is standard practice with the railroad's present conventional steam locomotives.

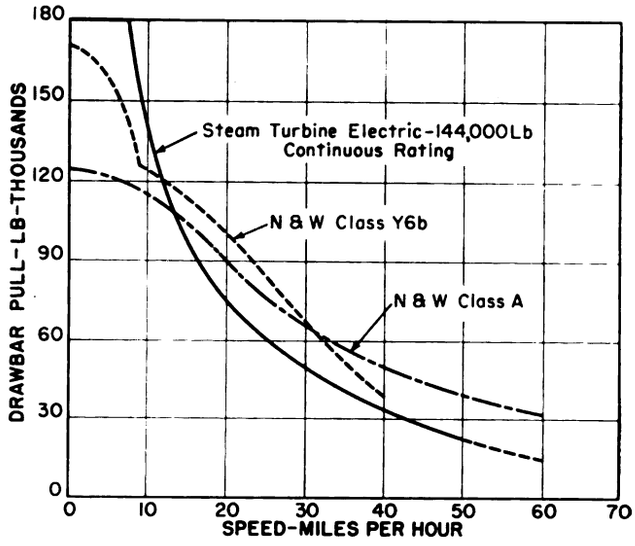
Turbines Pull Move Up to 12 MPH

In the mountainous districts the new steam-turbine-electric locomotive was compared with the N&W Class Y6b, a 2-8-8-2 Mallet, and in the flat districts the new locomotive's performance was compared with that of the N&W Class A, which is a 2-6-6-4, single-expansion, articulated locomotive. One of the curves shows the drawbar-pull in relation to speed for the three locomotives. The steam-turbine locomotive has the highest drawbar pull of the three locomotives up to about 12 mph, while the Class Y6b has a higher drawbar pull at speeds above 12 mph. The Class A has a higher drawbar pull than the steam turbine locomotive at speeds above about 13.5 mph.

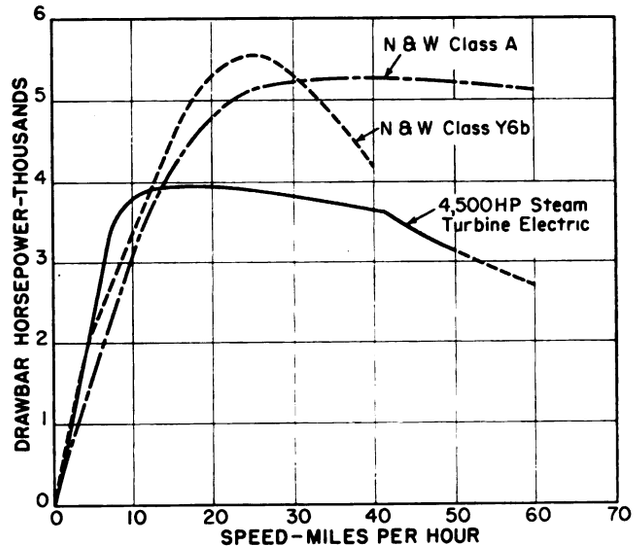
There is a drop in the turbine locomotive's drawbar pull at speeds above about 41.5 mph. There are no transitions in the traction-motor connections on the turbine locomotive, and only shunting of the traction motor fields. The turbine normally operates at constant horsepower and the speed of the turbine is controlled by the torque requirements of the generators up to the maximum turbine speed of 8,000 rpm, which is controlled by the turbine governor. The generators reach their maximum voltage after the last stage of field shunting has been made and the turbine has reached the maximum speed allowed by the governor. This point is reached at a locomotive speed of about 41.5 mph. Any increase in locomotive speed will increase the back emf of the traction motors and, since the generators are operating at maximum voltage, the current to the traction motors will be decreased so that constant horsepower is not maintained. This decrease in power at locomotive speeds above about 41.5 mph is evidenced by a lower steam flow to the turbine as well as a lower boiler firing rate.

The drawbar horsepower curves for the three locomotives show, in a different form, the same general comparison of the three locomotives as the drawbar-pull curves. The steam-turbine-electric locomotive has the largest horsepower available at the drawbar up to about 12 mph; the Class Y6b has the highest drawbar horsepower from 12 to 31 mph, and the Class A has considerable advantage over the other two locomotives at speeds above 31 mph. The unloading of the steam-turbine-electric at speeds above about 41.5 mph is more apparent in its drawbar horsepower curve. This is a condition that will be corrected on future locomotives.

The tests were conducted on the Radford, Pocahontas and Scioto divisions. The Radford division extends from Roanoke to Bluefield, a distance of 100 miles, and crosses two mountain ranges. The ruling grade, westbound, is over the Allegheny mountain range between Elliston and Christiansburg, being 11.5 miles of 1.32 per cent grade.



Drawbar-pull characteristics of steam-turbine-electric compared with two other N&W locomotives.



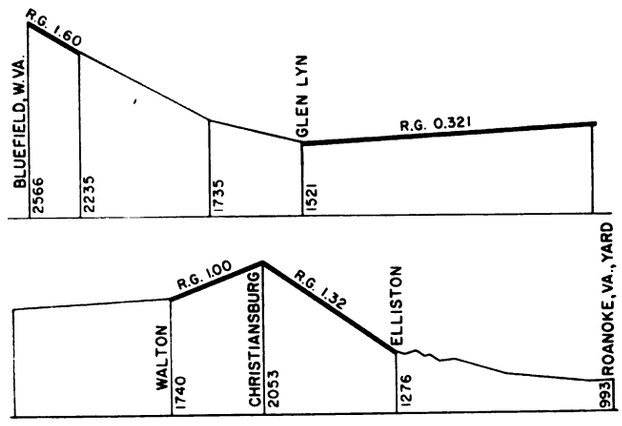
Drawbar-horsepower vs. speed comparison.

not compensated. From Walton to Glen Lyn the railroad follows river grade along New River. The steepest grade on this division is the three miles of 1.60 per cent grade, not compensated, going into Bluefield. This is not the ruling grade between Roanoke and Bluefield because it is much shorter than the Allegheny grade and is operated partly as a momentum grade.

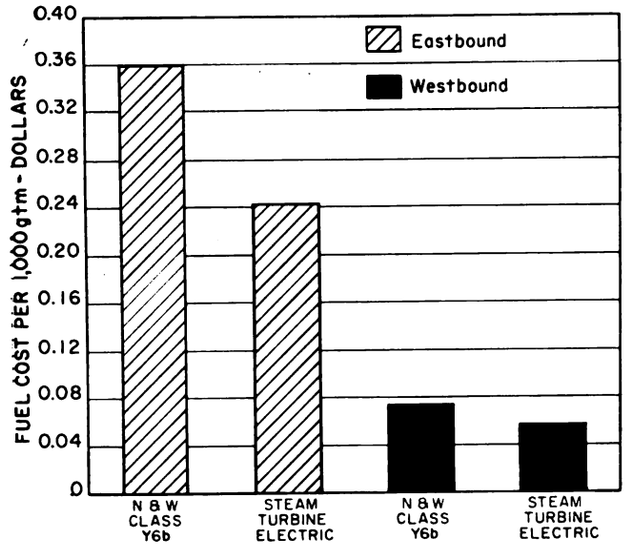
Dynamic Brake Helps

The westbound tests on the Radford division showed that, in day-to-day operation, the steam-turbine-electric locomotive would be capable of handling 3,600 tons of empty coal hoppers, Roanoke to Bluefield. During the tests the new locomotive handled a maximum of 161 empty coal hoppers with a total train tonnage of 4,052 tons westbound over this division. The tonnage rating for the N&W Class Y6b locomotive, westbound on this division, is 3,000 tons. The dynamic brake proved to be more capable of holding the trains on the 1.00 per cent descending grade between Christiansburg and Walton without using the air brake.

During the eastbound tests on the Radford division the



Condensed profile of N&W Radford Division—Roanoke, Va., to Bluefield, W. Va., 100 miles.



Comparison of unit fuel costs of the two locomotives while operating on the Radford District.

steam-turbine locomotive handled a maximum of 144 loaded coal hoppers with a total train weight of 13,073 tons. An eastbound tonnage rating of 11,500 tons has been established for the new locomotive. The present eastbound rating for the Class Y6b is 10,300 tons. Both of these ratings include the use of a Class Y6 pusher over the 8-mile 1.00 per cent compensated grade from Walton to Christiansburg. The dynamic brake on the turbine locomotive proved to be of great benefit in handling these heavy trains between bluefield and Glen Lyn and between Christiansburg and Elliston.

Comparative test results for the steam-turbine and the N&W Class Y6b locomotive on the Radford district are given in Table 1. The westbound test results were obtained with the turbine handling its nominal tonnage rating of 3,600 tons and the Class Y6b handling 100 tons more than its nominal tonnage rating of 3,000 tons. Dynamometer car tests have not been made of the Class Y6b handling 100 tons. Based on assigned tonnage ratings, the turbine locomotive handles 20 per cent more tonnage than the Class Y6b westbound on the Radford district.

Eastbound tests were made with both locomotives handling their assigned tonnage rating. The steam-turbine-electric locomotive handled an average of 13.3 per cent more tonnage than the Class Y6b, required 12.7 per cent more running time, and realized a fuel saving of 22.7 per cent.

Hatched bars on one of the graphs compare fuel costs per 1,000 gtm for the two locomotives when operating westbound on the Radford district, solid bars showing the eastbound fuel costs.

The 100-mile long Pocahontas division is another mountainous division, extending from Bluefield to Williamson, W. Va. In the westbound tests on this division the steam-turbine-electric locomotive showed only a slight operating advantage over the Class Y6b, since both locomotives can easily handle the relatively small coal movement from Bluefield to Kimball, where the trains are filled out with loaded hopper cars to the road's 175-car limit. The remaining part of the run into Williamson is down river grade along Tug River. The dynamic brake is responsible for the slight westbound operating advantage the turbine locomotive has over the Class Y6b on this division. This brake enabled operating crews to bring 5,600 tons down the 1.4 per cent compensated grade from Elkhorn Tunnel to North Fork without the use of air-brake retaining valves on the cars.

8,600 Ton Train Handled

The eastbound tests on the Pocahontas division showed that the steam turbine locomotive would be able to handle, in regular service, 8,600 tons of loaded coal hoppers from Williamson to Farm, W. Va., and 4,300 tons from Farm into Bluefield. The ruling grade from Williamson to Farm is the four miles of 0.6 per cent compensated grade between Wilmore and Roderfield. From Farm into

TABLE 1—COMPARATIVE PERFORMANCE OF THE N&W CLASS Y6B AND STEAM-TURBINE-ELECTRIC LOCOMOTIVES IN ROAD TESTS ON THE RADFORD DISTRICT

	Averages westbound-Roanoke to Bluefield				Averages eastbound-Bluefield to Roanoke			
	Class Y6b May 1953 Avg. of 3 runs	Steam turbine Sept. 1954 Avg. of 3 runs	Difference with Class Y6b as base		Class Y6b May 1953 Avg. of 3 runs	Steam turbine Sept. 1954 Avg. of 3 runs	Difference with Class Y6b as base	
			Actual	Per cent			Actual	Per cent
No. of revenue cars	129.3	146.3	17.0	13.15	112.0	127.0	15.0	13.39
Tonnage (includ. dynamometer and cab)	3,189*	3,673	484	15.18*	10,255	11,620	1,365	13.31
Total time, yard board to yard board, hr-min	3—59	4—22	0—23	9.62	5—05	5—57	0—52	17.05
Total time, start to stop, hr-min	4—36	4—57	0—21	7.61	5—23	6—22	0—59	18.27
Running time, start to stop, hr-min	4—31	4—54	0—23	8.49	4—12	4—44	0—32	12.70
Avg. speed, running time, mph	22.0	20.3	— 1.7	— 7.72	23.3	20.5	—2.8	—12.02
Running time, 1,000 gtm per hr	70.0	74.4	4.4	6.29	238.1	237.9	—0.2	— 0.08
Total time, 1,000 gtm per train-hr	68.7	73.7	5.0	7.28	185.7	177.3	—8.4	— 4.52
Coal as fired, tons	18.93	14.73	— 4.2	—22.19	12.55	10.89	—1.66	—13.23
Coal as fired per 1,000 gtm, lb	119.8	80.8	—39.0	—32.55	25.1	19.4	—5.7	—22.71
Fuel cost per 1,000 gtm	$0.3600	$0.2428	—$0.1172	—$32.56	$0.0754	$0.0583	—$0.0171	—$22.68

* The assigned tonnage rating for the Class Y6b is 3,000 tons; however, dynamometer car tests of the Class Y6b handling 3,000 tons have not been made. Based on assigned tonnage ratings, the turbine locomotive handles 20.0% more tonnage than the Class Y6b.

Bluefield the 7½ miles of 1.4 per cent compensated grade between North Fork and Elkhorn Tunnel is ruling. The present eastbound tonnage rating for the Class Y6b is 7,200 tons between Williamson and Farm, and 3,600 tons from Farm into Bluefield.

When handling the same tonnage as the Class Y6b on the mountainous Radford and Pocahontas divisions, the turbine locomotive made 4 per cent to 13 per cent less speed, but showed a fuel saving of 20 to 30 per cent. In these two mountainous districts the steam turbine electric was able to handle between 18 per cent and 27 per cent more tonnage, varying with the districts. With increased tonnage, the speed was 13 per cent less and the fuel saving, based on cost per ton mile, was 19 to 37 per cent. This fuel saving varied with the proportion of the district, allowing fuel capacity operation. The longer the turbine locomotive operated at full load, the larger the relative fuel saving.

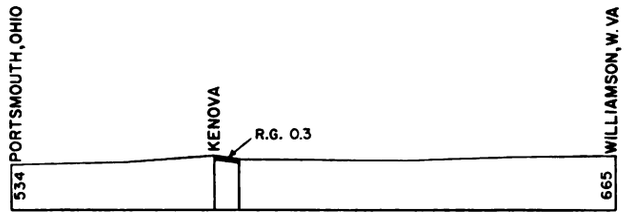
On the Scioto division, Kenova district, the steam-turbine-electric locomotive was tested and compared with the Class A locomotive, this district extending from Williamson to Portsmouth, Ohio, a distance of 112 miles. The ruling grades are at the approaches to the Ohio River bridge at Kenova, the westbound ruling grade being 2½ miles of 0.3 per cent compensated grade and the eastbound ruling grade being ½ mile of 0.66 per cent grade.

Table II summarizes the test results for the two locomotives on the Kenova district, eastbound and westbound; both locomotives handled relatively the same tonnage on this district—the 175-car limit.

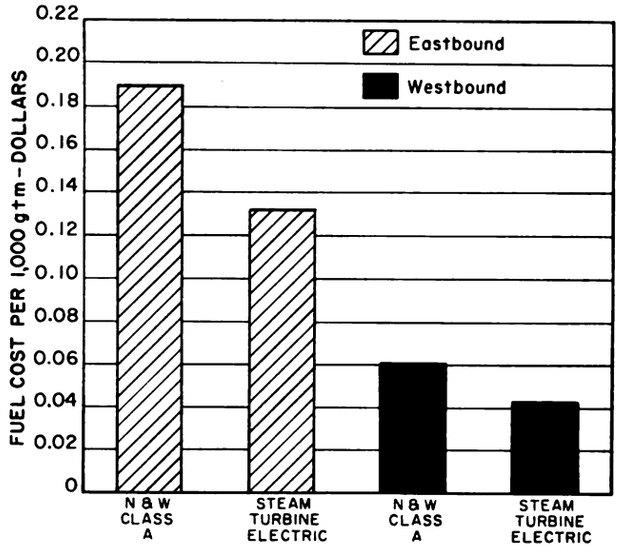
Westbound, from Williamson to Portsmouth, the steam-turbine-electric locomotive handled relatively the same tonnage as the Class A, but at a lower speed. The average speed of the turbine locomotive was 13.3 per cent lower than the average speed of the Class A. In gross ton-miles per hour, based on running time, the turbine locomotive test runs averaged 11.1 per cent less than the runs with the Class A, but the cost of fuel per 1,000 gtm for the steam turbine electric locomotive averaged 29.6 per cent less than for the Class A.

30 Per Cent Saving in Fuel

The eastbound test runs from Portsmouth to Williamson showed that the steam turbine locomotive could handle the maximum car limit of 175 empty coal hoppers, but, again, at a lower speed than the Class A. The turbine locomotive's average speed was 11.8 per cent lower than the Class A's average speed. In gross ton-miles per hour running time the turbine locomotive showed a deficit of 8.1 per cent in comparison with the Class A. However, the



Condensed profile of Kenova District of N&W Scioto Division.



How unit fuel costs compared in test runs on the Kenova District.

steam turbine electric locomotive's average fuel cost per 1,000 gtm during these eastbound runs was 29.9 per cent lower than the Class A's average fuel cost.

The hatched bars on another graph compare locomotive fuel costs per 1,000 gtm during test runs on the Kenova district in eastbound movement of empty coal hoppers. The solid bars show fuel costs for the westbound movement of loaded coal hoppers.

No major difficulties have been experienced with the steam-turbine locomotive at this time, although there have been some failures. These failures include a stopped-up stoker trough; broken flexible steam connections to the cold water pump; the failure of a traction-motor blower brakers; original main feed pump governor of improper size, and difficulty with the main turbine controls. These minor troubles have been corrected.

As of October 30 the new locomotive had accumulated approximately 19,000 miles of service on the N&W and,

TABLE II—COMPARATIVE PERFORMANCE OF N&W CLASS A AND STEAM-TURBINE-ELECTRIC LOCOMOTIVES IN ROAD TESTS ON THE KENOVA DISTRICT

	Averages westbound-Williamson to Portsmouth				Averages eastbound-Portsmouth to Williamson			
	Class A Oct. 1952 Avg. of 3 runs	Steam turbine Oct. 1954 Avg. of 4 runs	Difference with Class Y6b as base		Class A Oct. 1952 Avg. of 3 runs	Steam turbine Oct. 1954 Avg. of 4 runs	Difference with Class Y6b as base	
			Actual	Per cent			Actual	Per cent
No. of revenue cars	175.0	173.3	— 1.7	— 0.97	175.0	174.5	— 0.5	— 2.86
Tonnage (includ. dynamometer and cab)	16,028	16,422	394	2.46	4,130	4,309	179	4.33
Total time, yard board to yard board, hr-min	3—12	3—47	0—35	18.23	2—42	3—09	0—27	16.67
Total time, start to stop, hr-min	3—31	4—07	0—36	17.06	3—08	3—40	0—32	17.02
Running time, start to stop, hr-min	3—31	4—03	0—32	15.17	3—08	3—33	0—25	13.30
Avg. speed, running time, mph	31.6	27.4	— 4.2	—13.29	36.3	32.0	— 4.3	—11.85
Running time, 1,000 gtm per hr	506.0	449.7	—56.3	—11.13	149.9	137.8	—12.1	— 8.07
Total time, 1,000 gtm per hr	504.6	444.2	—60.4	—11.97	149.9	133.7	—16.2	—10.81
Coal as fired, tons	18.4	13.29	— 5.11	—27.77	15.10	11.03	— 4.07	—26.95
Coal as fired per 1,000 gtm, lb	20.7	14.6	— 6.1	—29.47	64.5	45.2	—19.3	—29.92
Fuel cost per 1,000 gtm	$0.0612	$0.0431	—$0.0181	—$29.58	$0.1906	$0.1336	—$0.0570	—$29.91

while it is too early to evaluate maintenance costs, routine maintenance has not been excessive. Adjustments to locomotive appurtenances, normally to be expected with a new type of locomotive, have been made during the tests. Electrical maintenance is comparable to that required on diesel-electrics; turbine maintenance has amounted to monthly tightening of flanged connections, and boiler maintenance so far has been solely in conformation with ICC requirements. Monthly cleaning has constituted the maintenance on boiler controls. The Zeolite water softener mounted on the tender is backwashed every 1,000 miles and regenerated every 8,000 miles. The operation of a fleet of these locomotives will permit the Zeolite softener to become a part of the terminal water treatment plant.

The big question mark in the early design stages of the steam-turbine-electric locomotive was the boiler. However, the performance of the Bailey meter-controlled Babcock & Wilcox boiler has surpassed all expectations. The boiler is easy to fire, makes sufficient steam for maximum demands, is exceptionally responsive to load changes, and can be fired with a clear stack at all steam demands.

The coal-burning steam-turbine-electric locomotive has definite promising possibilities. The ability of this 4,500-hp locomotive to handle the same, or greater, tonnages as present locomotives, with fuel savings up to 30 per cent at only a small increase in time, start to stop, makes it so attractive that it is imperative that further study be given to improvements in design that are apparent. The first cost of locomotives of this type is not known at present. Simplification of controls and elimination of some protective devices have already been found possible.

Passenger Car Design

(Continued from page 55)

such appliances are conventional but designed for the reduced car weight.

Whether individual railroads shall seek to revitalize passenger operations through use of much improved conventional equipment, by conversion to cars and locomotives of greatly reduced cost, or through a combination of the two approaches is, of course, a decision which can only be made by their respective managements after giving proper weight to the many influencing factors. The builders can be of service in presenting suggestions backed by sound engineering and economic studies, and by standing ready to build the kind of equipment best suited for the service in question.

Voltage regulation on the central powered train will be much improved over the dc systems. This will insure better quality and longer life of a lighting installation. Each car is equipped with a small battery to provide sufficient emergency lighting to allow for movement of passengers through the car. These batteries will be on constant trickle charge and will operate the lights through a relay in case of a power trainline failure.

Journal Lubrication

(Continued from page 51)

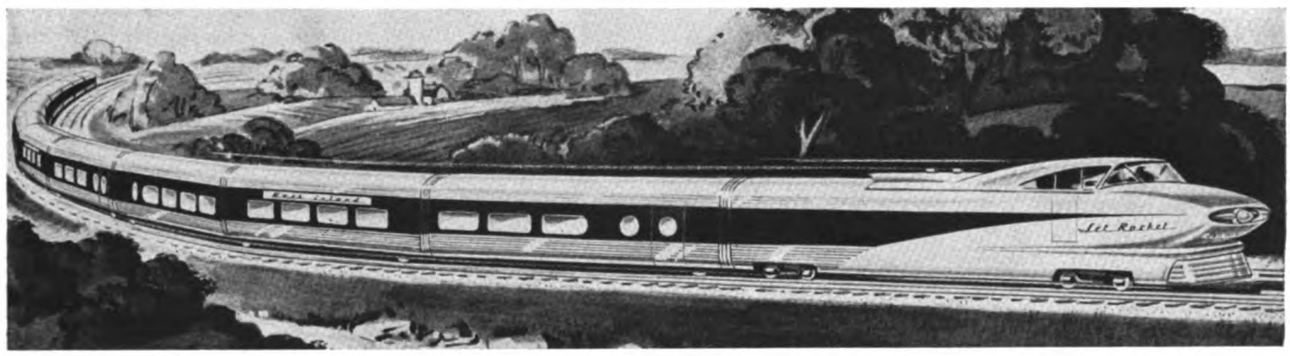
both in the bearing and the grease properties, which can be varied to influence the bearing performance.

The circulation of the grease is quite readily visible in the illustration of the open end of the journal box.

Through continued research and development in this field of bearing lubrication, it is certain even greater progress and achievements will be realized.

Conclusion

During the history of railroading, even from the early days of the wood-burning steam locomotive, the operating requirements of railroad jounal bearings have become increasingly severe. The challenge in this field has been continually met and the railroads, their associated organizations, bearing manufacturers, and lubricant suppliers, through research and development, have made many advances in the field of bearing lubrication. It is certain that their continued efforts will result in even greater achievements.



The Rock Island's Talgo-type streamliner, the "Jet Rocket," is now off the drawing board, and the train is ready for production. J. D. Farrington, president of the road, has revealed. A specially-conceived diesel locomotive, standing 10 ft 9 in. above the rails, will power the new train. The rounded roof of the 1,200-hp locomotive will conform to the height and contour of the train, which will consist of four, three-unit articulated cars having a seating capacity of 300. ACF Industries will build the "Jet Rocket." Mr. Farrington said the delivery date of December 1955, announced last June, still holds good. Featured in the locomotive will be auxiliary diesel engine units that will provide light, heat and air-conditioning for the train.

This car equipped with diesel trucks carries four Joyce-Cridland 35AHL jacks in a horizontal position under the hinged sheet-metal covers which may be tipped up and the jacks easily unloaded or loaded with the one-ton hoist shown.

How IC Changes Diesel Trucks

THE ILLINOIS CENTRAL uses a special type of flat car to change out trucks on diesel switchers at outlying points on the Iowa district, thus concentrating all but minor wheel and truck work at one central point, Waterloo, at the same time; eliminating the need to move the locomotive to and from Waterloo; reducing from 3-4 days to about 3 hours the time the outlying switcher is kept out of service; requiring only one set of lifting equipment to serve all points.

Equipped with diesel trucks instead of car trucks, the car leaves Waterloo with reconditioned trucks which are applied to the outlying switcher in place of the defective trucks. The latter are then put under the flat car, returned to Waterloo and repaired for subsequent use.

Basically the car consists of the diesel trucks, an underframe from a scrapped switcher and the necessary appurtenances such as air brakes, draft gear and couplers. The car carries its own set of four jacks to raise and lower the locomotive, and a hoist to lift the jacks on and off the car, an arrangement which permits the one set of lifting equipment to serve all the scattered outlying points.

The car carries four Joyce-Cridland jacks, Model 35 AHL of aluminum alloy. They are aluminum to minimize the weight (1,255 lb) and permit easy handling by the 1-ton hand hoist on the car. The air-operated model was selected because compressed air is available at even the smallest points.

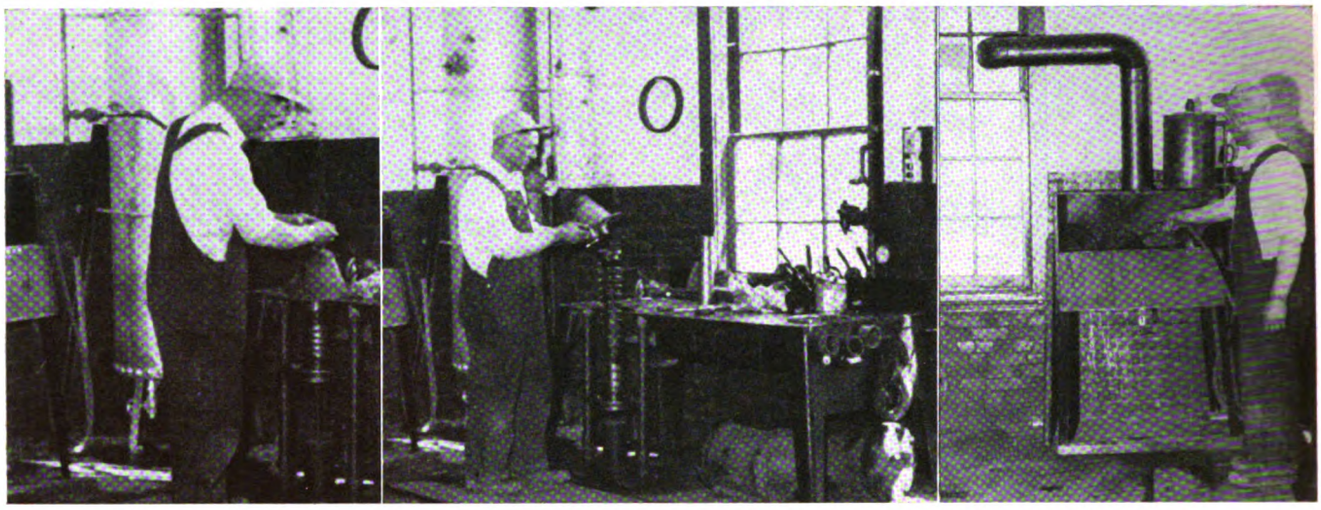
In case truck replacement on a switcher is required, the special flat car with repaired trucks mounted underneath is dispatched from Waterloo on the next freight train which will reach points as far away as Sioux City or Council Bluffs the following morning. Upon arrival of the car, the jacks are removed with the hoist and hooked up to an air line; the car is lifted by the jacks and set on blocks; the locomotive is raised; and the defective trucks are replaced with the rebuilt ones taken from under the flat car.

By this means, a complete truck change can be affected in approximately three hours at any outlying point. Previous to the use of this car it was necessary to bring the locomotive into the Waterloo shops, keeping it out of service three or four days.

While this special flat car is the latest and best equipped of a series it is not the only car of this general type used on the IC. Seven other cars which ride on diesel trucks to be changed out are in service. Four of these, like the new car, were built using former locomotive underframes while three have underframes built up from former freight car parts but with center plates substituted for the king pins.

The four portable 35-ton jacks raising a diesel switcher body while making truck changes.

Ideas for the Car Repair Man...



The air brake piston assembly (left) in position for lifting the spring. Pressure from the air cylinder (center) below permits removal of the retaining collar and the assembly comes apart. After cleaning, the parts are blown dry with air (right).

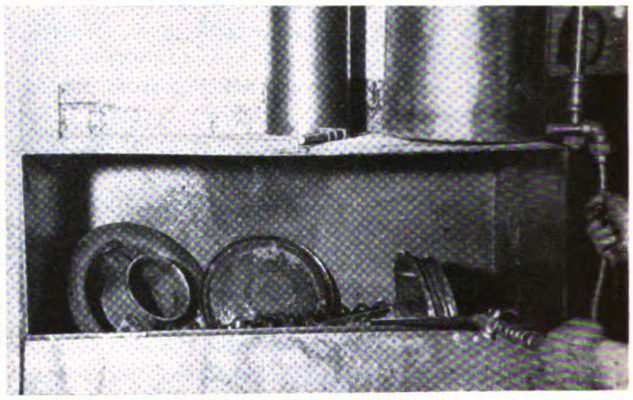
AIR-BRAKE CYLINDER OVERHAUL.—The overhaul and cleaning of AB air-brake cylinders is made better and easier by means of a special bench and spray cabinet which were worked out in the Anaconda, Mont., shops of the Butte, Anaconda & Pacific.

When a piston assembly is removed from a brake cylinder, it is secured in a semi-circular cut out section of the bench. A foot-operated air cylinder at the floor level, which is secured to the top of the bench by two pipes, is used to lift the piston spring to permit removal of the collar and the non-pressure head. The assembly may then be taken apart.

Parts of the piston assembly are placed in the cleaning cabinet, the door is closed and Texaco cleaning fluid is sprayed into the tank through perforated pipes. A reducing valve keeps the spray pressure at 20 lb.

The cleaning agent and the grease removed from the parts go to a barrel outside the shop. After the grease has settled, the solvent is reclaimed through a tap placed about 8 in. from the bottom of the barrel.

During the cleaning operation, the pipe which is run out through the window carries cleaning vapors to the outside. When cleaning is completed such solvent as may still adhere to parts is blown off with an air jet.



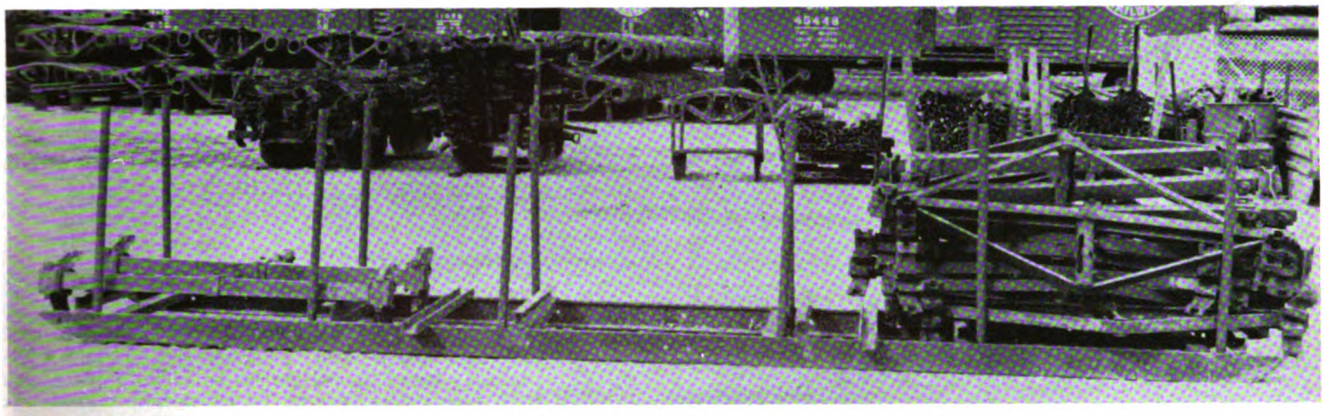
Parts to be cleaned in the cleaning cabinet.

When the packing cup is reapplied or replaced, a loop of hard twine is put under the lip of the cup with part of the loop protruding. This allows air under the cap to escape while the cup is being applied. After application, the string is pulled out. The cap would not fit or seat properly if air remained underneath.

STRADDLE TRUCKS HELP MOVE CAR PARTS.—Where freight car parts have to be moved quite some distance at car shops from stripping track to reclamation shop, storeroom and back to the repair tracks, straddle-type trucks have been found to speed up the movements as well as save labor in handling. This is especially true when pavement or roadways are somewhat rough and the straddle trucks with large pneumatic tires operate much easier than other trucks with smaller wheels especially if equipped with hard rubber tires.

At the Great Northern car shops, St. Cloud, Minn., for example, a Hyster Model M35160 straddle truck not only proves a great labor saver in handling lumber of all sizes and kinds, but is kept busy moving such things as couplers and brake beams on bunks of special design. The coupler bunks are simple in the extreme, consisting only of three loose planks, 3 in. by 12 in. by 16 ft resting on two 5-in. by 5-in. crossbearers notched to engage the straddle truck pick-up.

Twenty-four couplers are placed head down on this



Hyster straddle truck (right) in use moving 24 couplers at a time at GN car shops, St. Cloud, Minn. Special steel bunk (above) which can carry three piles of 20 brake beams, each, or a total of 60 in a single move by the Hyster straddle truck.

bunk and handled all at one time, the only securement necessary being to put a long sheathing board through the draft key holes of each line of couplers and wire these two boards lightly together at each end to make sort of a unit load. Couplers are actually handled several times by this means in intershop movement between the car shop, reclamation shop, machine shop and stores department which is almost one-half mile distant from the reclamation shop.

Similar economies are effected in the movement of brake beams which are handled on the special steel bunk illustrated. This consists of two 5-in. by 2½-in. angles, 18 ft. long, spaced 36 in. apart by suitable cross pieces and provided with six pairs of 1¼-in pipe uprights which can hold three piles of about 20 brake beams per pile. The total bunk capacity fully loaded is therefore 60.

The straddle truck simply moves over this bunk, picks it up quickly and in no time at all, 60 brake beams are moved wherever desired about the car shop, reclamation shop and stores department. On arrival at the designated shop, fork-lift trucks move the brake beams, one pile at a time, from bunk to repair position, or storage space.

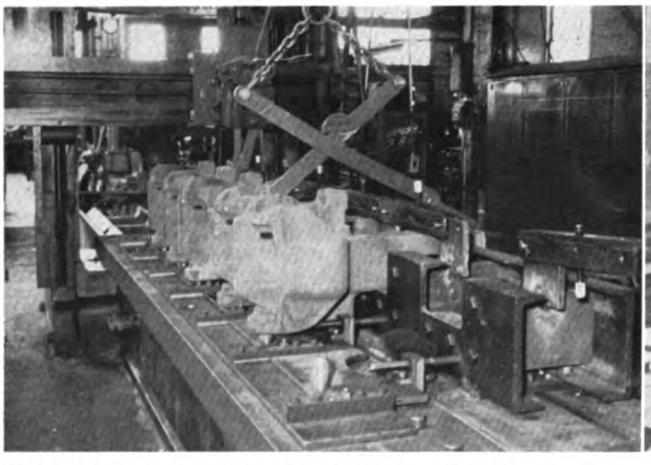
TURNING WHEEL SETS.—A simple but highly effective device for turning mounted wheel sets end for end consists of a wood base block and a long handle.

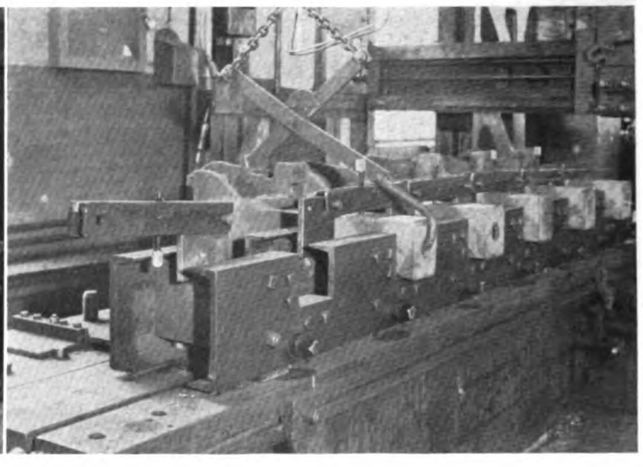
The distance from the bottom of the base block to the bottom of the groove in which the axle rests is 16 in., or an inch or two more than the distance from ground level to the bottom of the axle. This makes it possible to take advantage of the inertia of a rolling wheel set to lift itself without any appreciable exertion on the on the part of the operator. The wheel set is merely rolled slowly toward the turner, the base block of which is at approximately a 30-deg angle. As the axle contacts the groove, the momentum of the wheel set tends to

With the base block held at about 30 degrees, as shown at left, the wheel set is rolled toward it and the inertia lifts the set to this position shown above where they are turned easily by walking the end of the handle around.

continue it moving in the same direction and consequently straightens up the base block and lifts the wheel set. With both the tread and the flange clear, the set is turned end-for-end merely by moving the end of the handle.

The base piece of the device is a wood section 6 by 8 with a $\frac{3}{16}$-in steel plate 6 in. by 15½ in. wrapped around the bottom and up the sides. The axle itself rests on two pieces of ¼-in. steel on the bottom of the groove. The handle is 6 ft. 3 in. long with a maximum cross section 3 in. by 4 in. and tapering to 1½ in. square. Four bolts ⅝ in. by 6½ in. keep the wood from splitting. A center bolt ⅜ in. by 6½ in. holds the handle in place. The side plates are held by ½-in. by 8½-in. bolts. The side plates on the top of the base block are ⅜ in. by 3 in. by 6 in.



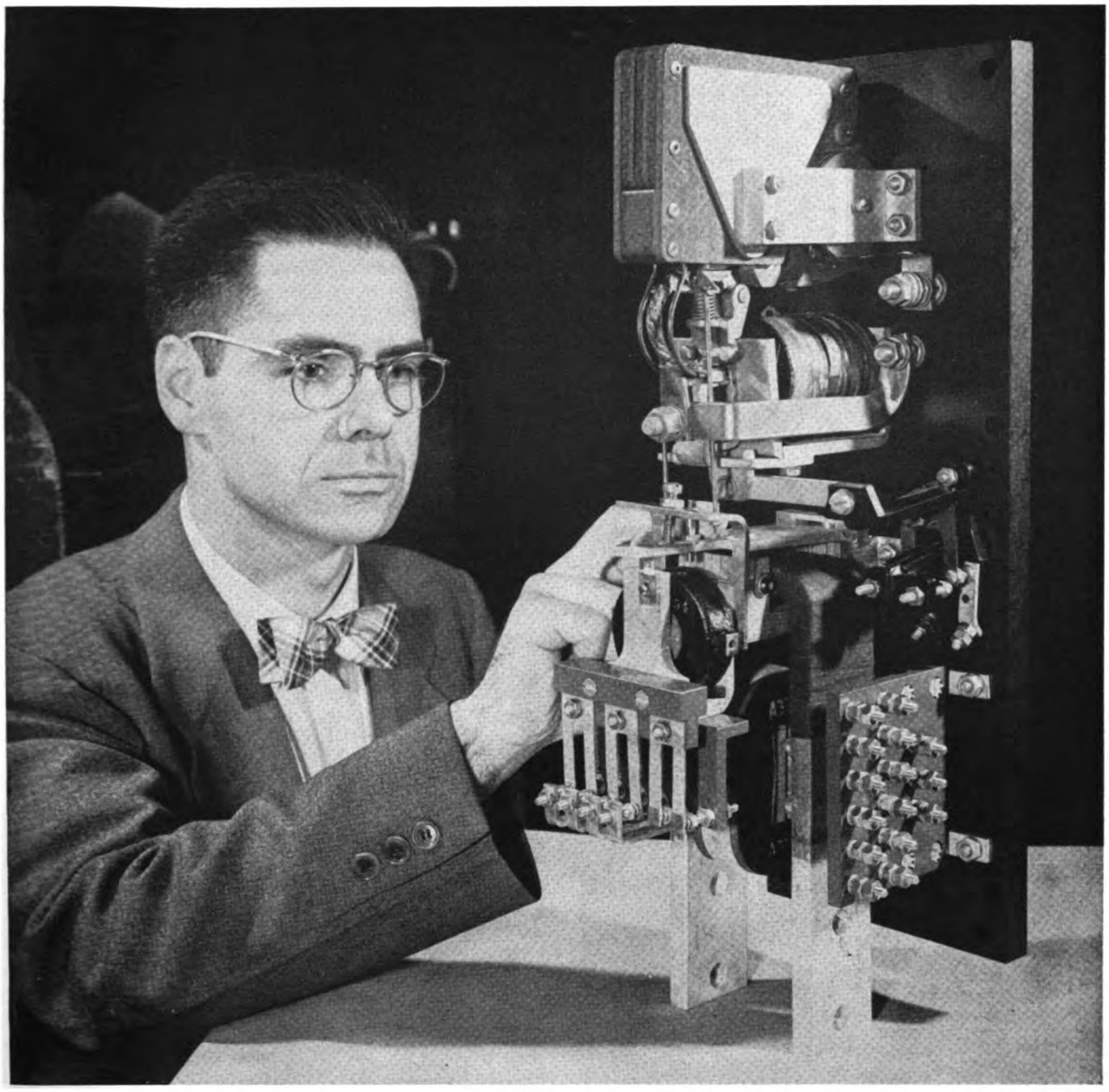


Front and rear of planer jig used in squaring coupler butts.

JIG FOR SQUARING COUPLER BUTTS.—In reclaiming couplers at a western shop they are first heated. straightened and inspected for cracks, then being moved to the machine shop where a special planer jig is used to machine the butts square, six at a time and at the rate of 48 in an 8-hr day.

This jig consists of two 10-in. channels spaced 12½ in. apart and cut out to accommodate six couplers held crosswise on the planer table. Hinged clamping bars with center screws are swung down over the coupler shanks to hold them firmly in the jig after being suitably positioned. Couplers are placed in the jig with special lifting tongs, the knuckle pin holes being slipped over $1\frac{9}{16}$-in. by 3-in. pins mounted on sliding plates, ⅝ in. by 10 in. by 17 in. These plates can be moved by long adjusting screws to position couplers crosswise in jig so that coupler butts will be in line regardless of shank length.

After being clamped, the coupler butts are machined square and smooth so wear plates of the required thickness can be subsequently electric welded on in the reclamation shop and the coupler shank length brought back to standard.



Impulse relay with cover removed.

Rate-of-Rise Flashover Protection

Generator flashovers may be made harmless or prevented altogether by a relay which predicts their occurrence

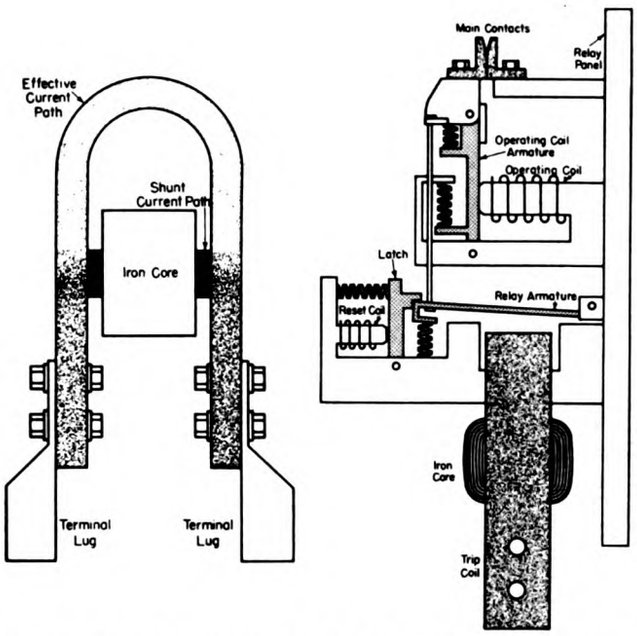
By W. A. Kirsch

An impulse relay has been developed that provides flashover protection of the main generator of diesel-electric locomotives.

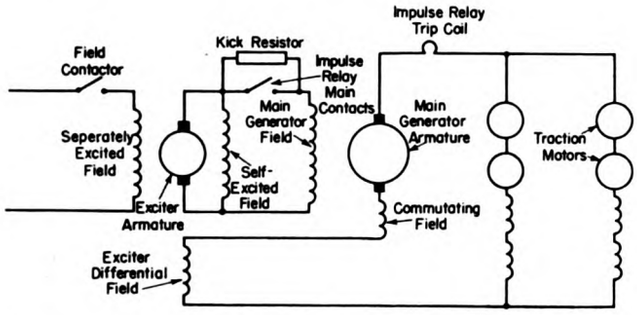
A locomotive main generator may flash over as a result of conditions that exist within the machine itself or as a result of external conditions such as short circuits, current surges due to control malfunction, or traction motor flashovers. Experience indicates that the majority of main generator flashovers result from external causes, usually a traction motor flashover.

The impulse relay protects the main generator from extensive damage resulting from these externally caused

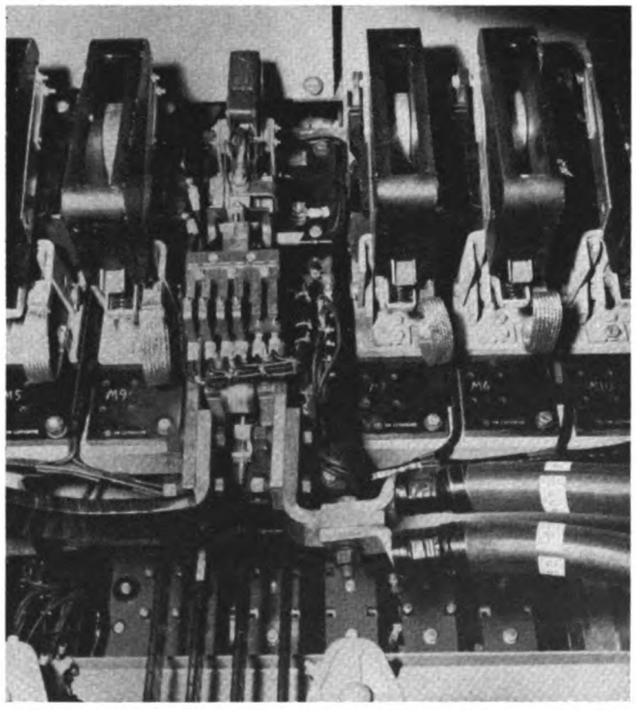
Mr. Kirsch is a transportation engineer with the Westinghouse Electric Corporation, East Pittsburgh, Pa.



Impulse relay trip coil (left), and simplified diagram of impulse relay with operating coil energized (right).



Wiring diagram showing connection of impulse relay in circuit.



Impulse relay installed on control rack of 2400-hp diesel electric locomotive.

flashovers. It operates so fast that the total time from start of the current rise to extinction of the contactor arc is only 0.025 second. Because of this high-speed operation, the impulse relay often actually prevents a flashover.

The ground relay protects the main generator in case of an internally caused flashover. A severe flashover going to ground results in a ground relay operation. When the ground relay operates, it opens the contacts of the impulse relay (explained later).

The impulse relay is so connected that the main generator load current passes through its trip coil and the relay trips when the load current reaches a pre-set value. However, when current through the coil rises very rapidly as it does when a short circuit or a traction motor flashover occurs, the relay is tripped by less than one-third of its normal tripping current.

As an example of typical settings, the relay used on certain 2,000- and 2,400-hp single-engine locomotives is set to trip at 2,800 amp on slowly increasing current. But as a result of a current increase from zero at the rate of 200,000 amp per second, the relay will trip at only 1,000 amp.

The relay exhibits this impulse characteristic because the trip coil, which has only a single turn, includes a current-carrying shunt path that is not effective in tripping the relay. The shunt path is surrounded by an iron core that makes it more inductive than the path through the magnetic circuit of the relay-operating mechanism.

The two current paths of the trip coil are so proportioned that when steady state current passes through it only 25 per cent of the total current passes through the section that is effective in operating the relay. The balance passes through the shunt path that is surrounded by the iron core. A rapidly rising current greatly increases the percentage of current in the effective path because the high inductance of the shunt path impedes rapid current rise there. Under short circuit conditions the current through the effective path becomes much greater than that in the shunt path, and trips the relay when its setting is exceeded.

The main contacts of the impulse relay are wired in series with the main generator field winding. A kick resistor connected across the relay contacts limits the peak voltage across the main generator field when the circuit is opened, to avoid puncturing the insulation of the field winding.

The main contacts are controlled by two coils. One of these is the trip coil. The relay armature associated with the trip coil is mechanically connected to the main contacts in such a way that, when actuated, it overcomes the force of the movable-contact spring and separates the contacts.

The contacts are also under control of an operating coil which, when energized, closes the main contacts. However, the operating coil cannot close or hold the contacts closed when the relay is tripped. When an overload or a current impulse passes through the relay trip coil the armature moves down to pull the contacts apart and the mechanical latch springs to hold the armature down. Movement of the latch de-energizes the operating coil by means of interlocking contacts, which results in further contact separation.

Because the contacts are under the control of both

the trip and operating coils, the relay is used to perform a regular circuit function as well as a protective function. When the circuit is set up for dynamic braking, the operating coil is de-energized. This puts the kick resistor in series with the main generator field to limit the current to the low value required in dynamic braking.

The impulse relay also is part of the ground relay protective circuit although it does not function to detect a ground. The circuit is arranged so that a ground relay operation de-energizes the operating coil of the impulse relay and opens the contactor in series with the exciter separately-excited field.

The impulse relay is equipped with five sets of auxiliary contacts or interlocks. Two of these are under control of the operating coil armature. One set of the two is so connected in the circuit that the engine starting circuit cannot be closed unless the operating coil armature is in the open-contact position. The second set is not used on any existing locomotives. The remaining three interlocks are under control of the latch. When the relay is tripped and latched, these interlocks de-energize the operating coil and open the contactor in the exciter separately-excited field, operate the warning signal, and idle the engine.

The latch is released by the reset coil. This coil is energized by pushing the ground-relay reset pushbutton which has an extra set of contacts for this purpose. To reset the relay, it is necessary to first idle the engine by moving the throttle lever to the *Idle* position—or in multiple-unit operation, to set the isolating switch in the *Isolate* position. The relay can then be reset by pushing the ground relay reset button. The relay contacts close when the throttle handle or the isolating switch is moved to a *Run* position.

Effects of Experience on Locomotive Design

Shortcomings of design are steadily being eliminated. High-potential testing of locomotives in service still requires study and clarification

L. E. Legg

There is no question regarding the soundness of engineering employed during the design and construction of diesel-electric locomotives, but many of the refinements follow as a result of the experiences gained by the various railroads who must operate them. This power plant on wheels was intended to out-perform a steam locomotive and it will, but there was a day when it would not. The iron horse was little affected by the weather, as we all know, but many of the earlier diesel-electric locomotives could not be operated successfully in such minor weather adversities as mist or fine snow.

Ground Relay Action

The ground relay is a very important piece of equipment on a diesel-electric locomotive but experience gained by the railroads has proven that it must not be over-sensitive. Some ground relays were first designed to trip on such low current leakage that grounds in the high voltage system created by mist or fine shifting snow would render the locomotive inoperative. This plagued the railroads to such an extent that the term "nuisance ground" was coined. Such a term was indeed fitting, as the writer has seen as many as nine passenger locomotives out of service at one time as a result of such grounds. After railroads desensitized their own ground relays with satisfying results, some of the builders standardized on a tripping value as high as five times the original. No ill effects were observed due to the desensitization. Another very important step in the right direction was in the adoption of neoprene insulated wire and cable. This original varnished cambric type of insulation permitted moisture creepage which caused "nuisance grounds." This change was made due to the many complaints by the railroads.

Another great source of trouble in the diesel-electric locomotive was grounded interpoles in the lower area of the main generator which also caused ground relay action. Due to the cooling air being taken from without the car body, it was often laden with fine snow and moisture which was driven into the main generator. Such moisture collected carbon dust, given off by the brushes, and finally found its way down around the three lower interpoles and caused premature decomposition of the insulation. After reaching a certain state, current leakage through the weakened insulation and carbon deposits would begin, causing tripping of the ground relay and often the main generator would have to be replaced.

One of the greatest maintenance costs was found in main generator and traction motor replacements resulting from the annual dielectric test required by the

Abstract of a paper by L. Elton Legg, electrical engineer, Chicago & North Western, presented at the Fall General Meeting of the American Institute of Electrical Engineers, held in Chicago, October 11-15, 1954.

Interstate Commerce Commission. Rule No. 253 in the booklet entitled "Laws, Rules and Instructions for the Inspection and Testing of Locomotives Other Than Steam" calls for a yearly test of the insulation to be made in a prescribed manner and the railways, of course, carry it out faithfully. Even though the greatest care is employed in performing the dielectric test, many times the insulation is damaged by such test to a degree requiring removal of traction motors or main generator. It is not such a sizeable task to interchange traction motors but such is not the case with main generators. In fact, to change a main generator, several heavy pieces of auxiliary equipment must first be removed and the roof of the locomotive lifted. The complete change costs three, four, five or six thousand dollars, in addition to losing the use of a $200,000 locomotive for not less than three days.

Dielectric testers as we have known them in the past were designed mainly for testing new or very good insulation. A common use for them was to cull out defective portions of electrical apparatus to prevent breaking down after reaching the hands of the purchaser or user, thereby protecting the reputation of a manufacturer. This culling out process was often done at the expense of replacing insulation but it has always been considered common and good practice. The necessity or importance of such test has not changed with the arrival of the diesel-electric locomotive, the practice being carried out by all locomotive builders. It is also equally important in railway armature rewind shops; however, after traction motors and generators have once been installed in the locomotive, the point of view definitely changes. The one and all-important issue is then, to give such equipment the proper care to insure long and dependable life. The result of using dielectric testers, which were designed primarily for testing new insulation, has brought about the absolute necessity of newer and better methods less destructive to the electrical equipment. Certainly, the Interstate Commerce Commission did not intend to impose such costly maintenance upon the American railroads when Rule No. 253 was written; otherwise, the last sentence of such rule would never have been included. This last sentence reads as follows and pertains to after test: "A careful examination shall be made of any weakness indicated and all defects remedied before locomotive is put in use." Most methods of dielectric testing do not give any indication of weakness but, rather, further damage the insulation to a point to which it could not possibly be remedied except by removal. Here, again, it was usually the insulation on one of the three lower interpoles which would break down under the stress of the required test. This problem was confronted from two different angles: the first, to give immediate relief, the second, with a long range view.

Long Range Relief

The long range program was to provide a barrier of hard insulation between the interpoles and frame of the main generator, as well as to improve the insulation on the winding itself. Here, again, the builders have followed suit. Some railroads have altered the ventilating system so as to take the cooling air from within the car body, thereby eliminating the moisture. Correction has also been effected by the builder in the latest type of locomotives. The main generator, being nearly a solid mass of metal, is a very difficult machine to clean. If an air stream is played into the open end, the carbon dust and dirt will move about somewhat but only a small portion of it will actually find its way out. Through necessity, some railroads have drilled holes in the generator fan, which permits the blowing of air from the engine end of the generator, driving the dirt and carbon dust outward. This has proven to be a very effective means and it is expected that the builders will take some action in this respect. In order to insulate the interpoles, alter the ventilating system and drill the generator fans on a fleet of diesel-electric locomotives, several years would be required as such work could only be accomplished at disassembly time; consequently steps for immediate relief were necessary.

Immediate Relief

Immediate relief was brought about by designing a non-destructive dielectric tester solely for railroad use. Rule No. 253 specifies the potential requirements as well

C & D Batteries, Inc., Conshohocken, Pa., held a two-day open house on November 29 and 30; to mark the formal opening of its new plant.

On November 29, 1953, C & D was struck by a disastrous fire, which destroyed more than 75 per cent of its plant. By hard work, and with the help of their suppliers and local business people, C & D was back in limited production in three days and full production by Christmas.

The new plant has been greatly enlarged and is of fireproof construction. New and improved processes for the manufacture of storage batteries have been put into operation. In addition, laboratory and cafeteria facilities have been greatly enlarged.

as the duration of the annual test. Even though most dielectric testing is performed with alternating current, the Interstate Commerce Commission does not specify the nature of the current to be used; therefore, it was decided to take advantage of the benefits afforded through the use of direct current.

The following requirements were considered pertinent in the planning and development of a dielectric tester which is thought to be most practical for railroad use;

- 1. It should be capable of impressing the dielectric stress upon the insulation as required by law and, in addition, should actually anticipate an insulation breakdown before it occurs, thus permitting the railroads to take advantage of the provision in the last sentence of Rule No. 253.
- 2. It should be designed so that the operator is not required to hold the test prods in the hands, as the required potential is considered dangerous, especially in the presence of perspiration. Further, once the high voltage circuit is made, it should not be interrupted until after the test has been completed.
- 3. An electrical instrument should register actual voltage impressed upon the insulation.
- 4. The energy for its operation should be taken from the locomotive battery, thus permitting its use, irrespective of location and availability of a-c power.
- 5. The division between good and rejected insulation should be definite and clearly indicated by an electrical instrument and not left to the judgment of an individual.
- 6. The value or intensity of the leakage current at the division point between good and rejected insulation should be comparable to that of dielectric testers commonly accepted by the trade.
- 7. The device should take its energy from a 32-, 64- or 128-volt battery, which is the potential of batteries commonly used on diesel-electric locomotives, and should automatically select the proper voltage for its use.
- 8. It should be equipped with a sixty second timing device to indicate the duration of the test.

The dielectric tester which was subsequently developed nearly meets the foregoing requirments. The actual impressed d-c voltage is indicated by a voltmeter on the panel of the tester. The intensity of the current leakage through the insulation is indicated by a second instrument whose dial is divided into two clearly defined areas, one colored green and marked "good", and one colored red and marked "reject". If the hand continues to swing upward as the operator gradually increases the voltage, he knows the insulation is defective and immediately reverses the rheostat to reduce the current flow before damage is incurred. After the defect has been located, that particular area may often be repaired. If the insulation is serviceable, the hand will swing upward only a short distance and stop. The operator then continues to increase the voltage to the test requirements. When this value is obtained, he switches a timer on and after one minute has elasped a bell rings and the test is completed. This non-destructive tester does not further damage decomposed insulation. It simply indicates that such condition is present.

Flashovers

Another very costly and troublesome item on diesel-electric locomotives is the damage resulting from main generator flashovers. Much discussion on this subject has taken place but it seems that definite cause has not yet been pinpointed. Flashovers occur under any and all conditions and at times the intensity is of such great violence that the armature is damaged beyond further use. Invariably, porcelains are shattered and, in some cases, pieces of porcelain have lodged between the brush holders and commutator causing great damage to the commutator. Usually, the brush holders must be removed for repairing. On some of the newer locomotives, the porcelains have been eliminated and replaced by a plastic insulation which does not seem to shatter under stress. Such plastic insulation over the studs does, of course, end the shattering of porcelain but the flashovers continue. The most common path followed by flashover current is from the heel of a brush holder to the frame of the generator and back to the heel of a brush holder of opposite polarity. During this burst of energy, damage is often done which requires two or three days to repair. One recent railroad development being tested by more than fifteen railroads is a neoprene cover moulded to fit snugly over the heel of the brush holder. This provides a barrier between the heel of the brush holder and the frame of the machine. So successful has the test been that 100 locomotives are being completely equipped by one railroad and a substantial number by several others.

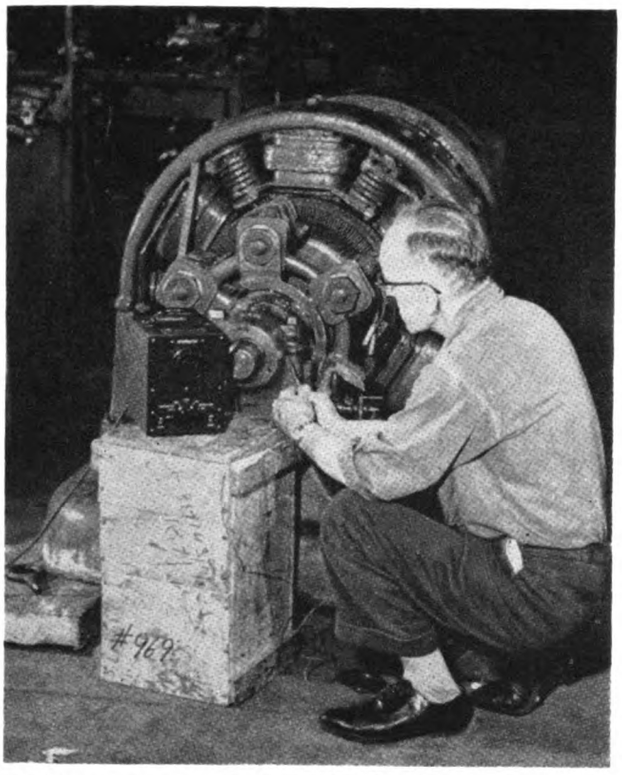
Fuses

Fuse holders built into the doors of high voltage cabinets have been a source of great trouble as fuses fall out of the holders and down into the high voltage circuits, frequently causing serious delays. Another difficulty is that enginemen will not dispose of burned out fuses, but, instead, place them back into the holders, often causing delays when spare fuses are needed. One means for correcting both conditions above mentioned is for the builders to provide a combination fuse holder and tester, with the various size fuse clips connected is series with a push button, indicating lamp and a source of battery energy. This would permit the enginemen and maintenance men to test all spare fuses in an instant by simply pushing a button. Still better is the use of circuit breakers instead of fuses.

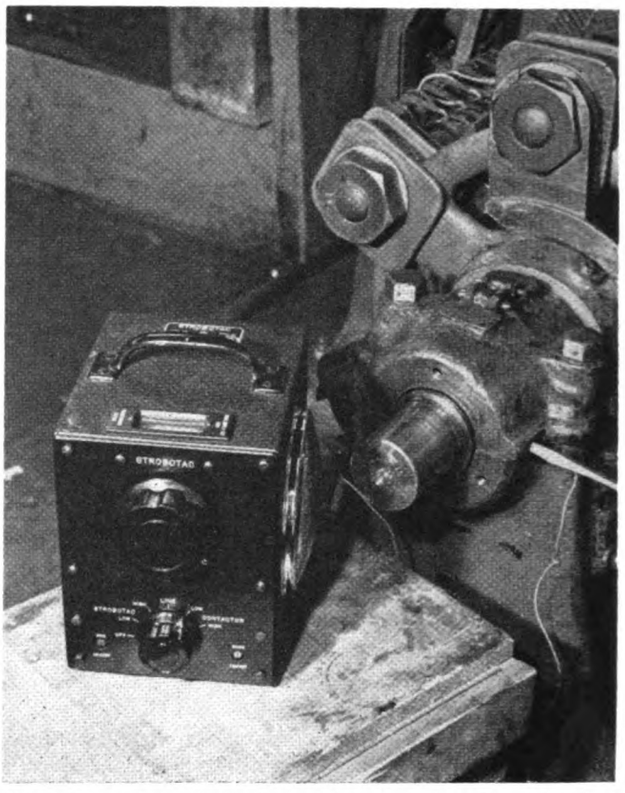
Interlocks

Interlocks have probably caused more road trouble than any other single item on a locomotive, due to being the open type contact which collects dust, causing poor electrical contact. Here, again, experience gained through operation has revealed the necessity of improved interlocks and the builders have again brought relief with the enclosed type; however, we must still live with thousands of the older type of interlock. One fast and effective means for checking interlocks for conductivity is through the use of a low reading ohmmeter which, of course, should read zero if the interlock being tested is in proper condition.

The above items are only a few of the many diesel-electric difficulties, some of which have been overcome through close cooperation between the railroad and the builder. The remarkable progress made by the various locomotive builders over the past decade is undoubtedly due to our country's competitive system of enterprise in combination with the railroad people's informative assistance.



Rudolph Sturm of the Dale Street Shop demonstrates the manner in which the Strobotac is used to balance rotating machinery. In actual test, the contact is mounted and not hand-held.



When the machine vibration is used to operate the instrument, rotating parts in the light appear to stand still.

The "Strobe" in the Railroad Shop

A form of stroboscope, called the Strobotac, has been put to many uses in the Dale Street shop of the Great Northern in St. Paul, Minn. It was originally purchased for calibrating electrical speedometers, but this is now only one of a number of services it performs.

One application, that of balancing the rotor of a 150-kw synchronous motor-generator set, is shown in the illustrations. The rotor imbalance causes the machine to vibrate and the Strobotac is used to determine the location of the unbalanced weight. An external electrical circuit is established through the machine frame and the instrument. One of the contacts on the frame is secure, and the other is made by a metal tip resting lightly against the machine. In this case, it is shown against the side of the bearing housing. The machine vibration causes a making and breaking of this contact and the Strobotac then gives off flashes of light which corresponded to the frequency of the vibration.

The machine shown under test runs at 1,200 rpm. At this speed it has been established that the movement of the machine due to armature imbalance lags 14 deg behind the position on the armature where weight must be subtracted.

If it is not found to be practicable to subtract weight, it can be added on the opposite side of the armature. The angle of lag varies with the speed and curves are available to show the angle for all speeds.

Before the testing is started, a reference mark is made on the shaft or armature. When the machine is running and causing the Strobotac to operate, the armature which is lighted by the Strobotac, appears to stand completely still.

Since contact is being made on a horizontal line, the point of imbalance will be 14 deg from the horizontal. The reference mark will appear to stand still and it is then necessary only to determine the angular distance between the reference mark and a point 14 deg from the horizontal. It is then a simple matter to stop the machine and measure back the angular distance between the reference mark and the 14 deg angle. Weight must then be added at a place 180 deg from this point. The procedure is repeated until the degree of balance wanted is secured, both ends of the machine being balanced in the same manner.

Balancing machines are used in the shop for traction motor armatures and other machines, but in such cases as the one shown, the rotating parts of the motor-generator set could not easily be mounted in the balancing machine. The Strobotac, made by the General Radio Company, Cambridge, Mass. is also used where there is no way of using standard tachometers for checking the operation of running machinery including commutator and brush performance, and for many other purposes.

How to Keep Generators Young

By Guy Franklin

"Man is as old as his arteries; electrical machinery is as weak as its insulation."

The above statement is basically true. On this premise, the careful maintainer will base his efforts to improve the performance of generators and motors.

In the case of electrical machinery, the insulation does not have to be old to be weak. There are factors other than age that affect the value of insulation.

Among the enemies of insulation are moisture, dirt, grease, oil vapors and lack of proper ventilation.

The early failure of insulation in main generators caused the writer to study the subject, to determine what might be done to improve generator performance.

It was quickly discovered that the principal cause of insulation weakness was the accumulation of oil on field and armature coils. This oily coating also covered brush-holders and the commutator.

An examination of the fan which supplied air for ventilating the main generator, revealed the fact that oil vapors from the engine room were being blown into the generator.

These oil vapors were settling throughout the generator and coating it with a sticky fly-paper surface which served to hold dirt and dust such as carbon dust worn from the brushes as well as any dust carried in from the engine room.

If the surfaces of coils and cables in the generator could be maintained in a completely dry condition, then it would be an easy matter to air blow, or wipe out dust accumulations. The problem was, how to keep oil vapors out of the generator.

It was a case of either completely eliminating oil vapors in the engine room, or capturing the vapors before they could be blown into the generator. This latter course was thought to offer the best solution of the problem.

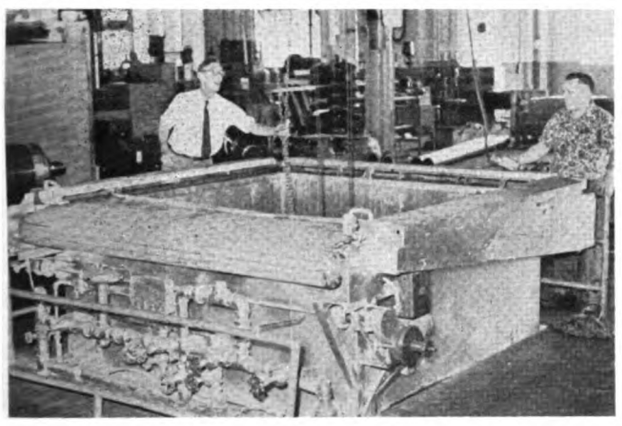
It appeared that we might provide air filters at the intake of the ventilating fan, and let the vapors settle out in the air filters, instead of being carried into the generator. Such a plan would be based on the use of dry (not oil-coated) filters. The filters were to be removed at regular 5,000-mile inspection periods, when the filters would be cleaned and dried for another tour of duty.

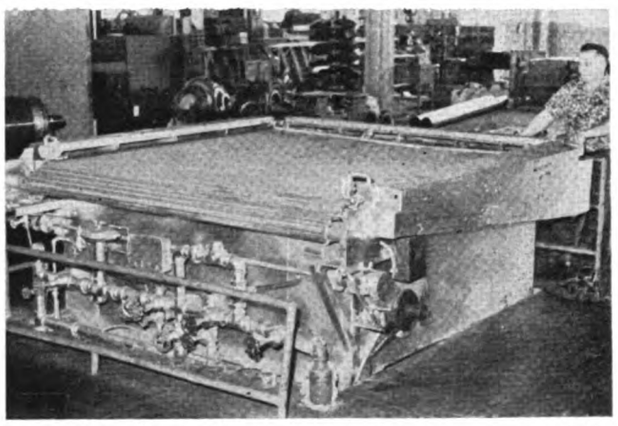
We had an adapter frame made to hold four 2-in. x 20-in. x 20-in. air filters similar to the regular car body air filters. This filter frame was designed so it could readily be bolted to the intake side of the fan housing. The frame was loaded with new dry filters, and applied to an E.M.D. freight locomotive unit. The main generator had been thoroughly cleaned like new, for the test.

At the end of 5,000 miles' operation, the filters were removed, and sent to the test department laboratory, with a request that filters be carefully cleaned and contents be weighed and identified.

It was found that the filter contents consisted of nearly five ounces of oil and slightly more than five ounces of dirt and dust.

The laboratory identified the oil as being, for the most part, filter coating oil from the car body filters. This





With the doors rolled back (left), the tank is ready for service. Right—When the work in the degreaser is completed, the touch of a pushbutton rolls the electrically-operated door over the top of the tank to keep solvent clean and prevent excessive evaporation.

Rolling Door Makes Degreaser Cover

The cover on a vapor degreaser helps to keep the solvent clean, and keeps upwanted things from falling into the tank when the degreaser is not in service. It also reduces loss of vapor into the air.

The cover most commonly used is made of sheet metal and is lifted on and off the tank by means of the hoist used for lowering things to be cleaned into the tank.

An extra motor-driven rolling door became available in the shops of the National Electric Coil Company at Columbus, Ohio, and this was laid on its side on the degreaser as shown in the illustrations. The door was almost exactly the right size and a little sheet metal work secured it in place and provided a close fit with the upper rim of the tank.

pointed up the importance of using an improved filter coating on car body filters.

The generator air filters on this test unit have proved to be an unqualified success. They have been in operation for two years. The generator remains in a very clean condition and has not been involved in flashover troubles.

Since there are sources of oil vapors other than car body filters in the diesel engine room, the use of a dry air filter (or oil separator) is highly recommended for cleaning ventilating air for main generators.

In the test outlined, the dry air filter intercepted one ounce of oil and one ounce of dirt per thousand miles of operation. This may vary in different classes of service, but the fact remains that it has eliminated the fly-paper coating previously spread throughout the main generator.

What is good for the main generator is also good for the traction motor and some roads have installed a 2-in. x 20-in. x 20-in. air filter on the inlet to the traction motor blower fan, with good results.

It would seem that locomotive builders would incorporate means of cleaning the ventilating air for generators and motors as part of standard equipment. It is just as important for generators and motors to have clean air as it is to supply clean air to engines.

The benefits to be obtained from removal of oil vapors from ventilating air to the electrical equipment may be listed as follows:

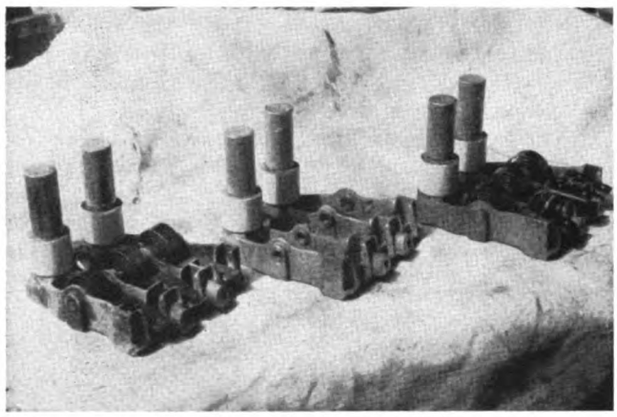
- Reduction in cleaning cost of generators and motors.
- Reduction in failures by improvement of insulation.
- Reduction in flashovers by elimination of many leakage paths.
- Improvement in brush life by elimination of oil and dirt from commutator surface.

If a generator is allowed to become oil soaked to the extent that its insulation will not pass the usual megger test, then it may often involve the removal of the generator from the unit for a thorough cleaning and baking. That is an expensive procedure.

It has been said "The future has in store exactly what is placed in store for the future."

That idea applies to the maintenance of diesel locomotives. If proper preventive maintenance is followed, the locomotive and its maintainers will enjoy a happy future.

The cleaning of ventilating air for generators and motors is part of preventive maintenance.



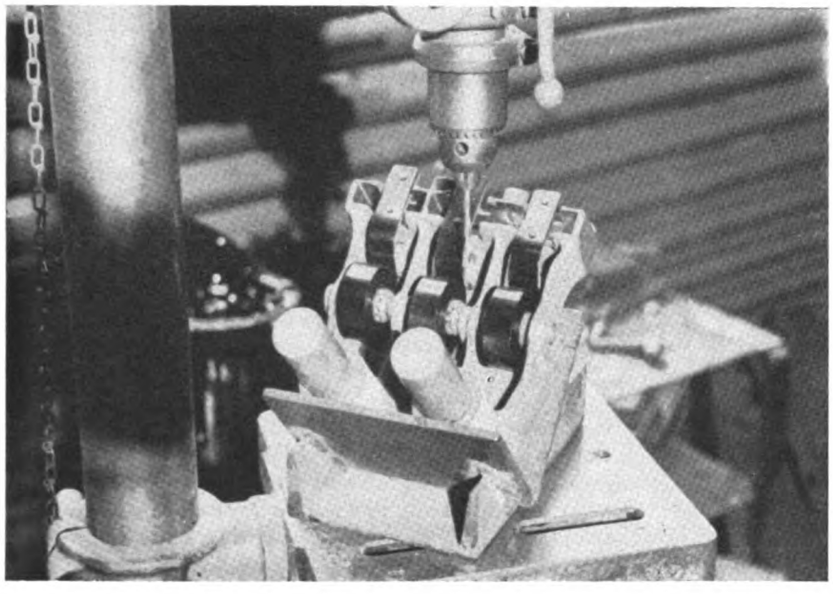
At the left is shown an assembly of brush rigging as it is taken from a motor. In the center is an overhauled casting equipped with bushings. At the right is a completely overhauled brush rigging.

Brush Rig Overhaul a la B & M

Everybody overhauls diesel locomotive brush rigging and each shop has developed its own means of doing the work. Details of procedure differ in various shops and the methods used by the Boston & Maine, in its North Billerica, Mass. shops are illustrated as a good example.

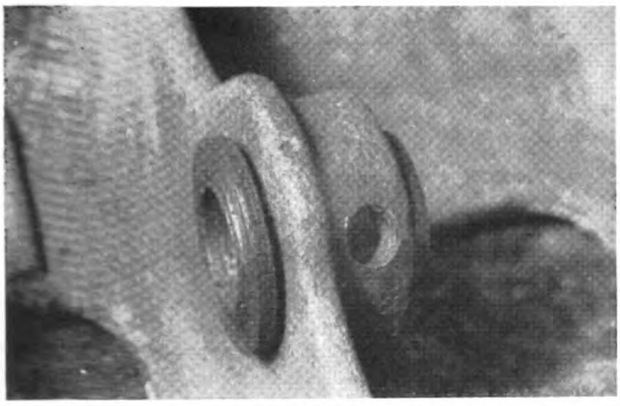
Brush rigging to be overhauled is removed from the motor, disassembled and washed in a hot detergent solution (Permag 70). The rigging is then baked in an oven for two hours at 250 deg F. While still hot, the castings with studs and insulators in place are bright-dipped (Permag 1653). The insulators are tested with a Megger insulation tester and are replaced, if necessary.

If the holes which support the brush holder shaft are worn, they are bushed. They are bored out to $^{9}/_{16}$ in. and



Above: One of the four hardened steel bushings for the brush holder shaft.

At left: A special jig is used to hold the brush rigging on the drill press stand for drilling the hole for the cotter key which secures the brush holder shaft.



One of the four bushings and its support are drilled for a cotter key which holds the brush holder shaft.

fitted with mild steel bushings. The bushings have an outside diameter of $^{9}/_{16}$ in. and an inside diameter of $^{3}/_{8}$ in. They are pressed into the holes in the casting and they have a shoulder on one end which is placed on the side toward the brush springs. With the springs in place, the bushings cannot work out even if they become loose.

When the bushings are in place, they are reamed to line and size. All four holes are reamed at once.

The next operation consists of drilling the hole through one of the bearing supports and bushing for the shaft-holding cotter key. The bushing in place with the hole drilled, is shown in one illustration. A special jig which holds the brush rigging in place on a drill press stand while the hole is being drilled, is shown in another.

The finger assembly with springs and brush shunts is then put in place and spring pressures are adjusted to a tension of 9 to 11 lb at the spring tips with the spring pulled even with the top of the brush box. The spring tension is varied by turning the bushing on which the spring is mounted from one adjustment hole to another and securing it to the brush holder shaft with a cotter key.

The hole in the holder casting for the shunt tip is reamed and the tip is soldered in place with tin solder.

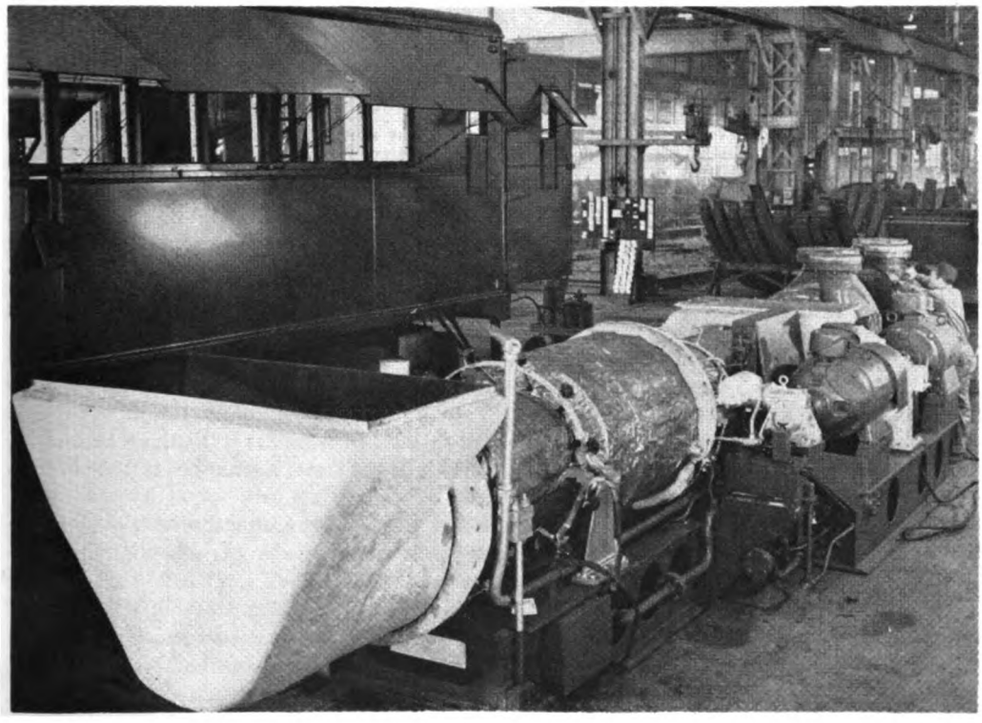
The final operation consists of a 1,200-volt high potential test of the brush stud insulators.

IN MEMORIAM—A. E. Voigt

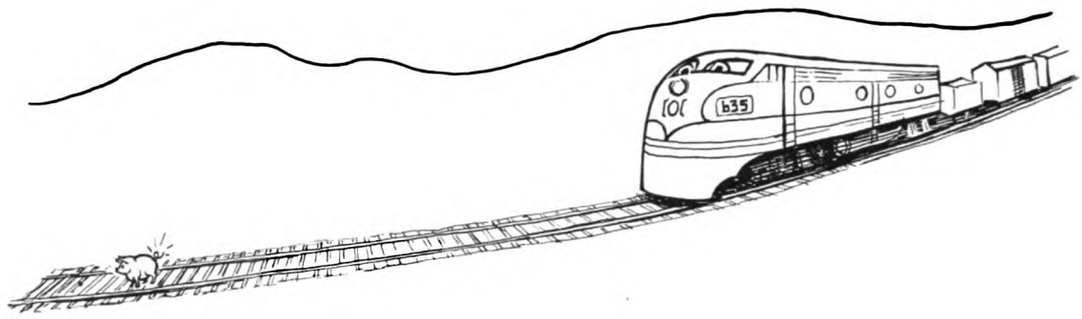
A. E. (Alec) Voigt, formerly car lighting and air conditioning engineer, Santa Fe, a pioneer in electric car lighting, died at the age of 69, in Topeka, Kansas on Sunday, December 5. It seems more than a coincidence that his passing should have followed that of J. A. Andreucetti, secretary emeritus, Electrical Section, AAR, by only eight days. No other two men were better known for their work with the railroad electrical associations or did more to bring the infant electrical department to its present state of manhood. No meeting—committee or general—was ever dull if Alec were in attendance.

Although Alec was often contentious, his position in the field was always sound. His stand on rubber composition battery jars should be recorded here. In the early days of car lighting, practically all battery jars were of this type. Quality of such products was not as it is today, and close competition among manufacturers kept prices too low to permit improvement. The result was that railroads generally went to lead-lined wooden trays with all the attendant trouble with leakers, etc. That is all the railroads but the Santa Fe. Alec stayed with rubber jars and one by one all the others came back into the fold.

Alec was a progressive with an inventive turn of mind. He knew when a change should be made, and he also knew when it should not. Always willing to assume responsibility, Alec did more than his share in furthering the use of electrical equipment in railroad service.



An 1,800-hp gas turbine-compressor is now being tested by the U. S. Army Corps of Engineers to determine its suitability for supplying compressed air. The gas turbine, two multi-stage centrifugal air compressors, a 50-hp starting motor, and a 60-kw generator and auxiliaries are all mounted on a fabricated steel bedplate. The plant requires only two external connections for starting, namely, electric power for ignition and motor-driven auxiliaries, and distillate fuel for the gas turbine. Once started, only the fuel connection is needed, since the 60-kw generator supplies the auxiliary motors. The manufacturer states that simple open-cycle gas turbine develops more power per unit of weight and volume than any other type of prime mover, and is thus ideally suited for this unit. Westinghouse supplied the 8,750-rpm gas turbine, and Clark Brothers Co., Pittsburgh, Pa., the compressors. The plant was installed by the Stacey Brothers Division of the Dresser-Stacey Company, Cincinnati, Ohio.



The Pigtail That Stopped the Train

By Gordon Taylor

A single unit E-8 locomotive had just received a 10,000-mile inspection, and was dispatched for service on a passenger train. Leaving the yard for the station, it was towed by another unit, which explains why the failure did not develop before the unit left town.

After the train left town it moved only a few miles before there was a flashover on the commutator of the No. 2 main generator. A road foreman was riding the unit and he promptly shut the engine down. After examining the flashed condition of generator, the crew decided they could not continue the use of the No. 2 engine.

Since the train was too heavy for the No. 1 power plant alone, it was necessary to send out another crew with a GP-7 to assist the E-8 to complete the run. This involved a serious delay, (2 hr and 30 min) to get the train under way again.

Cause of the Trouble

When the E-8 unit arrived at the end of its run, the electrician at Terminal B found that the trouble had started from a brush pigtail on the one o'clock holder, which had rubbed against the commutator riser.

The commutator riser had a good coating of red insulating varnish, which acted as an insulating shield. However, this insulating varnish had a light scratch or scar around its circumference as though something had been rubbing against it. The only stationary portion of the generator which bore corresponding marks was the brush holder pigtail at the one o'clock brush holder. The brush next to the riser showed plenty of evidence that it was the offender.

The brush pigtail had clearly worn through the insulating paint on the riser until the high voltage that existed after the unit got under way caused a flash. After the first flash occurred, the air around that portion of the commutator became more or less of a conductor, which made it possible for an arc to flash from the top of the brush holder to the commutator and to the nearest differential field.

The damage required a thorough clean-up of commutator and replacement of brushes and repair to the brush holder, to return the unit to service.

As we reconstructed the cause of this failure, some maintainer, in cleaning the main generator, must have used an air hose to blow dirt out of the generator. In doing so, the blast of air moved the brush pigtail nearest riser to a point where it would drag the riser. That dragging brush pigtail served as a trigger to set off a flashover.

An inspection or cleaning of a main generator is not complete until all brush pigtails are securely fastened and properly clear the commutator.

How to Arrange Brush Pigtails on the Main Generator

The main generator brushes for these locomotives are split brushes arranged in pairs. The brush shunts or pigtails are very flexible unless they are laced together to make a support for one another.

To give the shunts proper support, the rear brush should be passed through the shunts of the front brush. You will find you are stepping. This steps the rear brush between the shunts of the front brush. The next brush is then in rear, between the shunts in front of it. This stepping through of the brushes should be done for a total of four steps.

The brush shunts are then properly laced around one another, so that the shunts are self-supporting. All brushes on the main generator should be similarly stepped.

The brush that is located next to the commutator requires one additional move to prepare it for its position. When this brush is placed in the holder, the shunts should not be secured to the brush holder until the terminal lug is twisted a half turn. Then it can be fastened down with the screw.

This method of treating generator shunts will eliminate the possibility of brush shunts or pigtails contacting the commutator riser.

Most important of all, the generator must be checked before the cover is closed to see that all brush pigtails are securely attached and that none of them is fouling the commutator.

Questions and Answers

Interchange Rules

This is the thirteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

141-Q—Who is responsible for fire damage to refrigerator car resulting from overturned portable heater which was not adequately secured when installed?
A—Handling line, per Paragraph (10) (k) of Rule 32.

142-Q—Would it be advisable to recommend the revision of Rule 32 to provide car owner's responsibility in cases where fire damage to refrigerator car resulted from overturned portable heater which was not adequately secured when installed?
A—No. In most cases the car owner has no jurisdiction over the placement of his cars for loading and therefore should not be responsible for fire damage from such cause. Proper inspection at time car is loaded would disclose such conditions and correction could then be made.

143-Q—In cases where welded draft lugs become sheared off on a loaded tank car and the railroad elects to drill holes in center sills and bolt draft lugs in place of welding, what would be the status of such repairs?
A—Such work is considered as temporary repairs for which no charge should be made. Defect card should be attached to the car to compensate the car owner for welding of the holes involved and the labor for removing and replacing draft gear to make such repairs.

144-Q—Would it be proper for car owner to make claim versus last repairing line for damaged draft gear in case where repairs consisted of renewal of broken coupler yoke and incidental R. & R. of draft gear which previously had corners burned off by a cutting torch?
A—No. The R. & R. of item in question which already had corners burned off does not constitute the perpetuation of wrong repairs under the present rules.

145-Q—Who is responsible for shifted tank, shearing of all tank anchor bolts and associated damage caused by impact, the center anchorage having been secured by square head machine bolts?
A—Where machine bolts in question are not of driving fit in reamed holes, then all damage as the result of impact is considered as owner's responsibility.

146-Q—Where stenciling showing periodic air brake attention is located on hopper car approximately 6½ ft above rail and 4 ft from end of car, would such location be proper?
A—No. The stenciling in such location would not comply with the intent of Paragraph (f) of Rule 60.

147-Q—Where a road removes draft gears less than one year old and in serviceable condition from a wrecked foreign car for inspection purposes and then fails to comply with request from car owner to return same along with other serviceable material, what kind of adjustment should be made by the handling line?
A—The handling line should either comply with the request of car owner to return such serviceable gears or, if unable to do so, should issue counterbilling authority to cover the secondhand value of such gears.

148-Q—What is it that prices, etc., have not been incorporated in the Interchange Rules to provide for the new QRR brake cylinder release valve?
A—In view of the limited use of the QRR Brake Cylinder Release Valve, it is not desirable to incorporate provisions regarding repairs and prices for same in the Interchange Rules at this time. In cases where the QRR Brake Cylinder Release Valve is repaired or renewed, charges should be on the basis of actual time for labor and storehouse cost for materials, per Rule 105.

149-Q—Where railroads lack a sufficient supply of their own cars to meet the requirements for loading of high class commodities, under what conditions may they make limited repairs at expense of car owner to empty foreign cars on hand to make them suitable for such high class loading.?
A—Under the provisions of Interchange Rule 1, any empty foreign car required for loading on the handling line may be repaired within the limits specified in Interchange Rule 120 and bill rendered versus car owner, provided the repairs cover owner's defects and do not of themselves raise the car to Class A from a lower classification. In other words, this would amount to the repairing of a Class Q car which had been in bad order condition.

150-Q—As an example, where handling line needed an empty foreign car for loading a high class commodity, would it be permissible to make miscellaneous repairs at car owner's expense to damaged portions of flooring, roofing, sheathing, lining and doors on car which was otherwise suitable to continue for Class A loading.
A—Yes.

Fairbanks-Morse
Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Battery Ammeter

F134-Q—Where is this meter located and what does it indicate?
A—This meter is located on the electrical cabinet and indicates charging or discharge rate of the battery.

Other Cab Equipment

(Bulletin 1706—101-A, page 21)

F135-Q—Describe the cab heaters as used on these units.
A—There are two hot water cab heaters, one each for engineer and fireman, with motor driven fans under control of the cab heater switches, providing air circulation.

F136-Q—Where are the control valves located?
A—Water to the heaters is controlled by a valve located on the left side of th eengine. A small valve admits steam to the hot water lines, and is located overhead in the nose.

F137-Q—What precaution must be taken with regard to admission of steam to the cab heaters?
A—Never admit steam to the heaters unless the engine is down, and then not wothout the water valve open. The heater elements are not designed to stand the temperature of live steam.

F138-Q—What precaution must be taken in cold weather?
A—Always keep shut off valve open in cold weather, except when unit is shut down and heaters are drained.

Emergency Fuel Trip

F139-Q—How many emergency fuel trips are on this locomotive, and what is their function?
A—Three, each connected to close the one emergency fuel cut-off valve at the left rear corner of the fuel tank, when the ring is pulled.

(Bulletin 1706—101-A, page 22)

F140-Q—Where are the emergency fuel trips located?
A—One fuel trip is located in the operating cab behind the fireman, and one on each side of the locomotive at the fuel tank.

F141-Q—How does the cut-off valve function and how is it reset?
A—The cut-off valve shuts off fuel to the steam generator as well as the engine, and when pulled, must be reset.

Engine Room Control Panel and Gages

F142-Q—Where is the engine control panel and gages located?
A—On the right side wall opposite the governor end of the engine.

F143-Q—What items are included?
A—Fuel pump breaker, isolater lever, engine stop button, alarm lights, ground relay and sealed surge relay remote reset button, lube oil pressure gage (across aisle on engine water tank), fuel oil pressure gauge (across aisle on engine water tank), and fuel tank level gage.

F144-Q—Where is the engine water temperature gage located?
A—On the engine water outlet header (opposite the engine room side door).

F145-Q—How does the fuel pump breaker function?
A—This breaker, on the control panel, starts the fuel pump but not unless the engine fuel pump breaker is first closed.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Engine Room

G129-Q—How are the cylinder locations, etc. identified?
A—The two ends of the engine are designated FRONT and REAR, which will serve to identify the cylinder locations and ends and sides of the engine.

G130-Q—What parts are on the FRONT end?
A—The governor, water pumps and lubricating oil pumps.

G131-Q—What features are mounted on the REAR end?
A—The blowers, oil separator and generator are mounted on the REAR end.

G132-Q—How is the engine situated in the unit?
A—The engine is so placed that its rear end is toward the front end of the unit when the unit is operating in its normal forward direction.

Engine Control and Instrument Panel

G133-Q—Locate the engine control and instrument panel.
A—The panel is mounted on a frame which supports the engine cooling water tank near the governor end of the engine.

G134-Q—Does each power plant have its own engine control and instrument panel?
A—Yes.

G135-Q—What is mounted on this panel?
A—The lube oil pressure and suction gauges, fuel tank gauge, along with the start, stop and isolation and fuel pump switches.

(Manual 2310—Page 116)

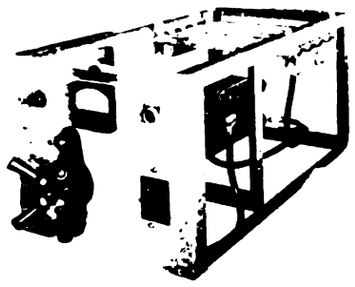
G136-Q—What are the positions of the Isolation Switch?
A—Two positions: START (handle Horizontal) and RUN (handle vertical).

G137-Q—What takes place when the switch is in START position?
A—The power plant is disconnected from throttle control and the engine speed is reduced to idle.

G138-Q—When the isolation switch is in START position, how are the power contactors in the electrical control cabinet affected?
A—They will not operate in response to the movement of control levers.

G139-Q—How is Dynamic Braking affected?
A—The unit will exert no retarding effect.

G140-Q—What other features are affected?
A—The ALTERNATING FAILURE alarm is inoperative. The START and STOP buttons are effective only when the isolation switch is in START position.

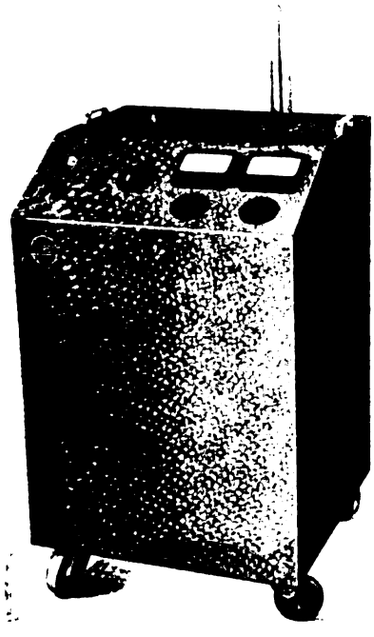


Battery Charging Panel

Suitable for use in coach yards for the charging of diesel and passenger coach batteries, this device is available in two sizes, one for use on a 75 volt d-c supply line and the other rated at 150 amp for use on 50-volt supply. Units of higher ratings can be produced to satisfy specific requirements.

The models are of the dead front type similar to the manufacturer's cubicles recently announced and now standard in many battery shops. The instrument panel contains a pilot light for indicating when the unit is operating, an ammeter showing when current is charging, a rheostat for stepless adjustment of charging rate, a pushbutton for reading of battery voltage, and a disconnect switch.

Overall dimensions are 19½ in. wide, 17 in. high, and 36 in. deep. *Curtis Development & Manufacturing Co., 3266 N. 33 Street, Milwaukee 16, Wis.*



High Voltage dc Test Set

The Hypot, a mobile 45 kv dc high voltage test set, has been made available as a standard model designed for plant and laboratory use in testing wire and cable, rotating machinery, insulating material, etc.

Manufacturers Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive information desired; requests will be handled direct by manufacturers.

1. LOCOMOTIVE CLEANING. *The Lix Corporation.* 12-page bulletin (L-18) "Diesel-Electric Locomotive Maintenance," gives recommended procedures for cleaning various parts of the locomotive with Lix universal engine parts cleaners.

2. CARS. *Thrall Car Manufacturing Company.* 20-page 3-color fully illustrated brochure "Cost Cutting Customs on 'Customs'" shows many of the standard and special cars made by Thrall, includes interchange cars, industrial cars, rebuilt cars, cars for lease, and car parts.

3. FILTER CARTRIDGE. *The Briggs Filtration Company.* 40-page booklet "Briggs, Pioneers in Modern Oil Filtration" in a series of data sheets describes, illustrates and gives specifications on the full-flow A-428 disc-pac railroad filter cartridge.

4. COUPLER. *The Buckeye Steel Castings Co.* Technical information bulletin 202 gives complete information on the new Type "F" interlocking coupler and attachments for freight service.

5. SHOVEL HOIST DRIVE. *Harnischfeger Corporation.* 3-color bulletin (X-156), divided into 3 sections, gives complete story of Magnetorque hoist drive for P&H shovels; contains on-the-job photos, cutaway drawings, and a schematic comparison with adjustable voltage systems.

6. PIPE FITTINGS. *Watson-Stillman Fittings Div. H. K. Porter Co., Inc.,* 4-page 2-color bulletin (RR-1) "Socket-Welding Pipe Fittings For The Railroad Industry" gives complete product descriptions and engineering data on the company's line of socket-welding fittings.

7. WIRE ROPE ASSEMBLIES. *Macwhyte Company.* 24-page catalog (5201) "Macwhyte Safe-Lock Wire Rope Assemblies" lists standard industrial terminals, describes, illustrates and gives complete specifications.

8. ELECTRODES. *Metal & Thermit Corporation.* Complete set of catalogs and literature describes the entire line of Murex electrodes for arc welding as well as rods and wire for gas, submerged arc and inert arc; data includes physical properties, chemical analyses, qualifications, procedures, sizes, and general engineering information.

9. GAS ANALYZERS & ALARMS. *Mine Safety Appliances Company.* 24-page brochure (0703-3) describes and illustrates Mine Safety Appliances Company's complete line of Combustible Gas Analyzers and Alarms, shows how the instruments work, contains part-by-part descriptions of the components of the analyzers.

10. GRAPHITE ELECTRODES. *United Carbon Products Company.* First completely modern catalog of graphite electrodes for the Spectroscopic profession, contains data and specifications on Spectroscopic Preformed Custom Electrodes, the new Platrode Series, Ultra Pure Graphite Rods and Powders.

11. TUNGSTEN. *Sylvania Electric Products, Inc.* 20-page multi-color brochure (NP-243) describes and illustrates the manufacture, properties and uses of tungsten, includes very attractive 2-page flow chart showing how tungsten is made and quality-controlled from ore to finished products.

12. TAP HOLDER. *Marcellus Mfg. Company.* Bulletin (M-2) describes and illustrates, with photos and drawings, the new Marcellus releasing-type tap holder; includes specifications and parts drawings.

13. BLAST CLEANING. *The Ruemelin Mfg. Company.* Bulletin (#100) describes and illustrates the complete Ruemelin line including blast cleaning machines, dust filters and welding fume collectors.

14. FLEXIBLE SHAFT MACHINES. *Franklin-Balmar Corporation, N.A. Strand Div.* Catalog (C-210) presents tabular data in easy-to-read form on 3 basic types of Strand machines: single speed direct drive, multiple speed countershaft drive, and multiple speed gear-driven Strandflex line.

15. ALLOY TOOL BITS. *Allegheny Ludlum Steel Corporation.* 4-page fifth edition of the technical information bulletin (CB1) describes and illustrates ALX alloy tool bits, includes new data on applications, grinding, tool angles, speeds and feeds, brazing, and stock sizes.

16. LUBRICANT. *Alpha Corporation.* 2-page 2-color bulletin (104) describes in technical detail Molykote Microsize lubricant; features graphic picturization of relative particle sizes of molybdenum disulfide powders in relation to their ability to penetrate crevices of ground bearing surfaces.

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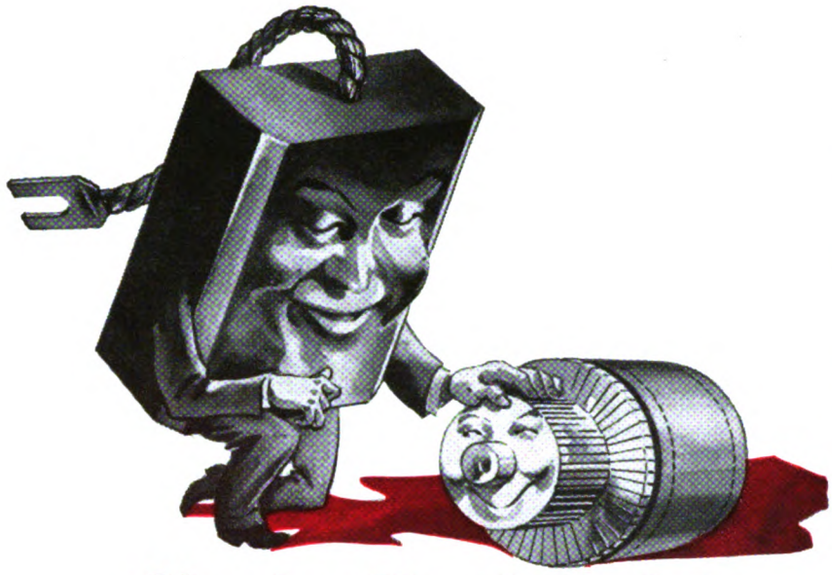
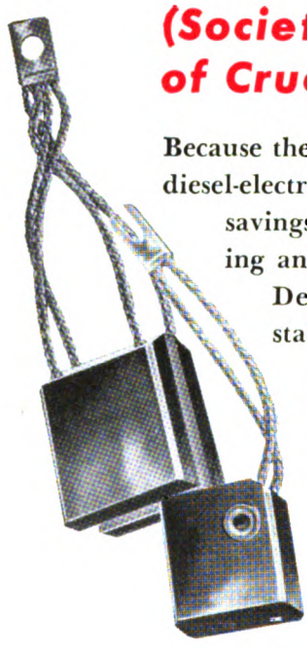


Charter Member of the

S P C C

(Society for the Prevention of Cruelty to Commutators)



Because they're "kind" to commutators, Stackpole diesel-electric brushes pave the way to worthwhile savings by reducing commutator reconditioning and time out for service.

Designed for good commutation and stable filming qualities even under bad conditions, Stackpole brushes have time and again proved their ability to keep commutators in service for exceptionally long periods . . . and with outstandingly good brush life in the bargain!

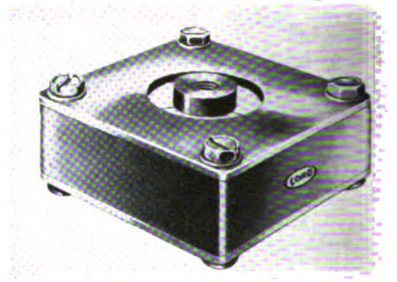
STACKPOLE diesel-electric BRUSHES

BRUSHES FOR ALL ROTATING ELECTRICAL EQUIPMENT • AVIATION BRUSHES • ELECTRICAL CONTACTS • CARBON-GRAPHITE BEARINGS • CLUTCH RINGS • SEAL RINGS • TROLLEY AND PANTAGRAPH SHOES • WELDING CARBONS • RAIL BONDING MOLDS • FRICTION SEGMENTS • RESISTANCE WELDING AND BRAZING TIPS • CARBON PILES . . . *and dozens of other carbon, graphite and molded metal powder products.*

STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

Output voltage is 0-45 kv read on a voltmeter connected directly across the output with ranges of 0-15, 0-30 and 0-45 kv. Maximum output current at rated voltage is 2.5 ma read on a micro-ammeter with ranges of 0-50/250/2500 microamperes. Output is obtained through a voltage doubuler circuit with metallic diodes, eliminating rectifier tubes and filament transformers.

Other features include a primary circuit breaker with secondary trip, a non-locking push button switch to energize high voltage, suitable range selector switches and indicating pilot lights. The wrinkle finish steel case on the standard model is caster mounted and measures 24 by 24 by 36 in. Net weight is 250 lb. *Associated Research, Inc., 3758 West Belmont avenue, Chicago 18.*



Vibration Damper

This device, developed to provide the additional damping required in many vibration control systems, can be varied to fit the particular characteristics of the suspension system.

Application of the damper is said to reduce the amplitude at resonance, resulting in lower forces being transmitted to the mounted equipment. The product is so designed as to provide damping in any direction, and is composed of an unique arrangement of components chosen to meet specific requirements. *Lord Manufacturing Company, Erie, Pa.*

Pipe Cutter

This heavy duty pipe cutter with an extra strong frame, is said to be lighter in weight without sacrificing strength. It fits the hand comfortably and has an unbreakable formed steel handle. Precision machining guarantees accurate tracking of the cutter wheels.

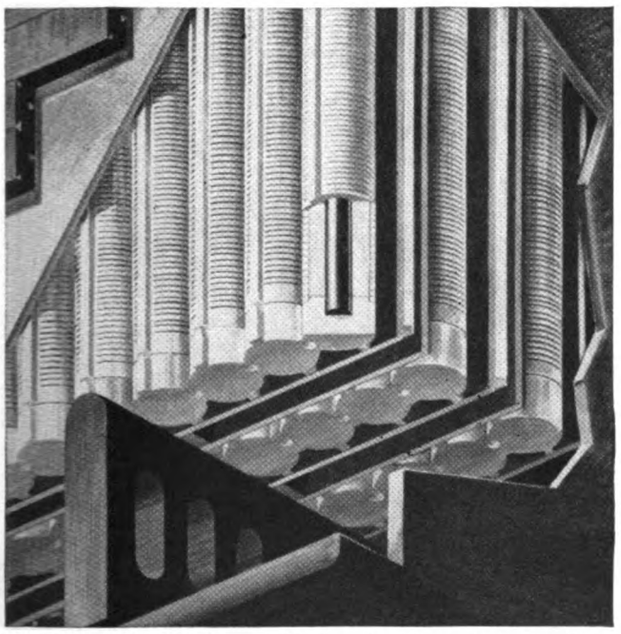
Another feature of the device is the quick-release pins which allow instantaneous changes of cutter wheels or changeover from cutter wheels to rollers. These pins can be removed with one hand by depressing a spring. *The Erie Tool Works, Erie, Pa.*

KEEP MORE PASSENGERS COMFORTABLE

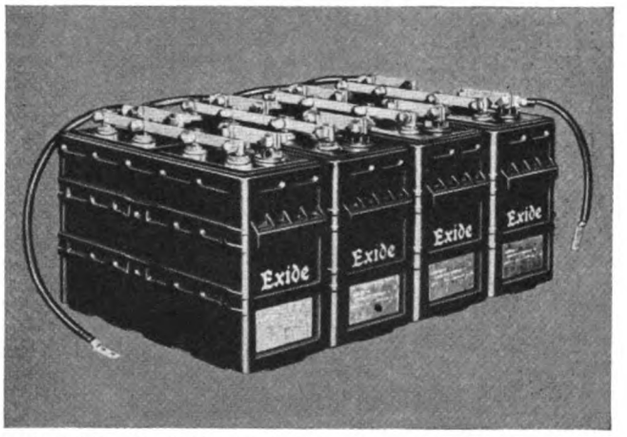
. . . with bright, steady lights and cool cars!

Built by The Budd Company, this new Santa Fe coach on the El Capitan provides maximum travel comfort, with adjustable head and leg rests, fluorescent lighting, air conditioning, clean styling.

COMFORTABLE passengers are satisfied customers. Exide-Ironclad batteries insure ample power for bright, steady lights and comfortable cars even during long stops. Built to withstand hard, continuous service, they give you worry-free performance, maintain high, uniform voltage under all operating loads. Lower costs for operation, maintenance and depreciation make Exide-Ironclad batteries your best power buy—AT ANY PRICE!



THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power*. Also, more active material is retained, giving *longer working life.*

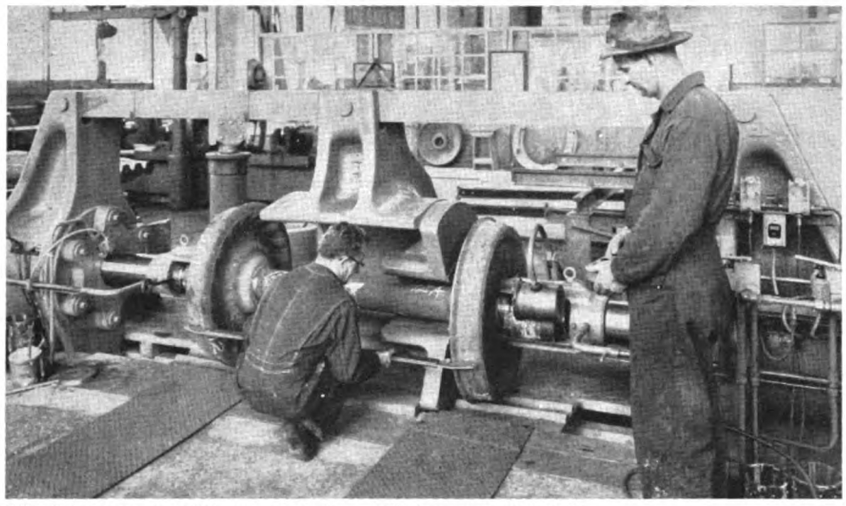


IMPROVED Exide-Ironclads now have power tubes made from *non-oxidizing* plastic for longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 5010 (Installation and Maintenance of Car Lighting and Air Conditioning Batteries).

Your best power buy
. . . AT ANY PRICE!

Exide®
IRONCLAD® BATTERIES

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

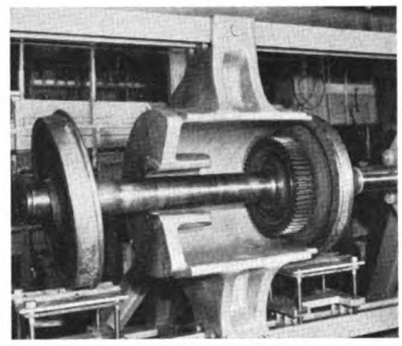


Wheel press converted by use of Rodgers cylinders and pump units.

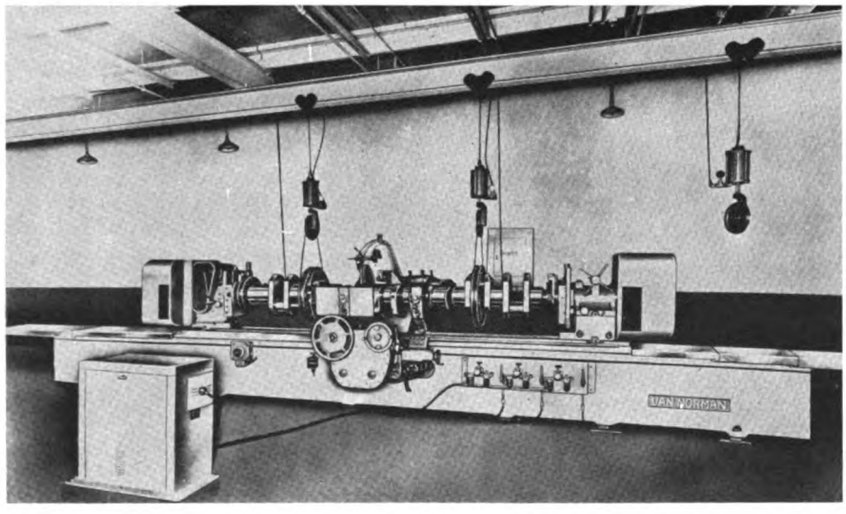
Hydraulic Press Conversions

Using Rodgers cylinders and pumping units, a series of old presses equipped with obsolete low-pressure pumps and rams have been modernized in a California railroad shop. In all instances the cylinders were installed by the customer inside of existing ram cavities without the necessity of other than minor modifications to head castings.

All installations are equipped with remote control by means of electric push buttons, and with the direction of ram travel controlled by means of manually operated levers. If desired, the lever controls can be replaced at a later date by remote control electrically operated push buttons. Connections between the pumps and cylinders may be made either by tubing or high pressure hose. *Rodgers Hydraulic Inc., 7401 Walker Street, St. Louis Park, Minneapolis 16.*



Diesel driving axle being handled in press.

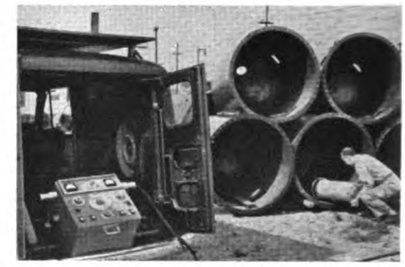


Crankshaft Grinder

A crankshaft grinder for diesel locomotives, Model ELW, has a swing of 36 in. and space between centers of 167 in. It is designed to grind crankshafts in the 150 to 160 in. range and has as standard equipment a 10-hp grinding wheel motor, a 1-hp dc motor with speed variator and controls on the workhead, a ½-hp variable dc motor with control and a dc converter.

Extra equipment includes a split pulley compensator unit, air cylinder pressure gauges, air hose, Norgren lubricator, upper pulley unit, rail trolley and yoke, monorail, wheel center unit, balancing arbor, wheel balancing stand, radius dresser, etc.

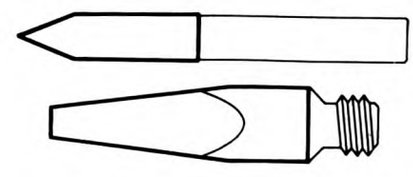
By using a strain gage between the cheeks of the throws, the distortion from the sag in the shaft is clearly indicated. By applying air pressure on the compensator units, the shaft is lifted upward until these strain gauges settle down to zero reading. *Van Norman Company, Springfield, Mass.*



Portable X-Ray Unit

A portable industrial x-ray unit, capable of producing a 360-deg radiation sweep enables operators to attain a high degree of inspection efficiency and to greatly reduce cost of inspection. The device can be placed inside a pipe or pressure vessel and used to take inside-out x-ray views. Thus, it confines the radiation within the enclosed area and increases protection to personnel against radiation exposure. It also permits the making of a complete circumferential weld radiograph with a single exposure.

The unit, Model OX-175, consists of a tank to house the x-ray tube and energizing transformers linked to control and power source by inter-connecting cables. The entire unit can be easily transported to any desired location. It can be operated at x-ray tube voltages from 45,000 to 175,000. *X-Ray Department, General Electric Company, 4855 Electric avenue, Milwaukee 1.*



Soldering Iron Tips

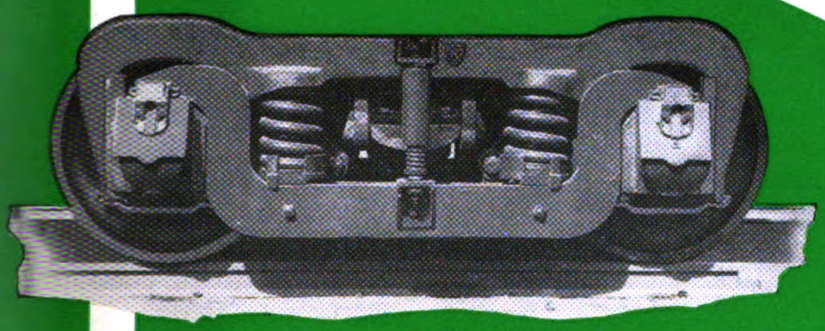
These Hexclad Tips are said to outlast copper tips as much as 10 to 1 with practically no heat loss. Because they last so long and require no filing or dressing, tip maintenance is practically eliminated.

The tips have a heavy durable coating of iron alloy over the copper base on all exposed surfaces. Inserted part of the plug tips also have a coating which is sufficiently thin so that good heat transfer to the tip is

(Continued on page 86)

Southern Pacific Box-Express Car
with latest type Commonwealth BX Trucks

Latest Type COMMONWEALTH BOX-EXPRESS CAR TRUCKS



Offer Many Advantages For Commodity Cars In Passenger Train Operation . . .

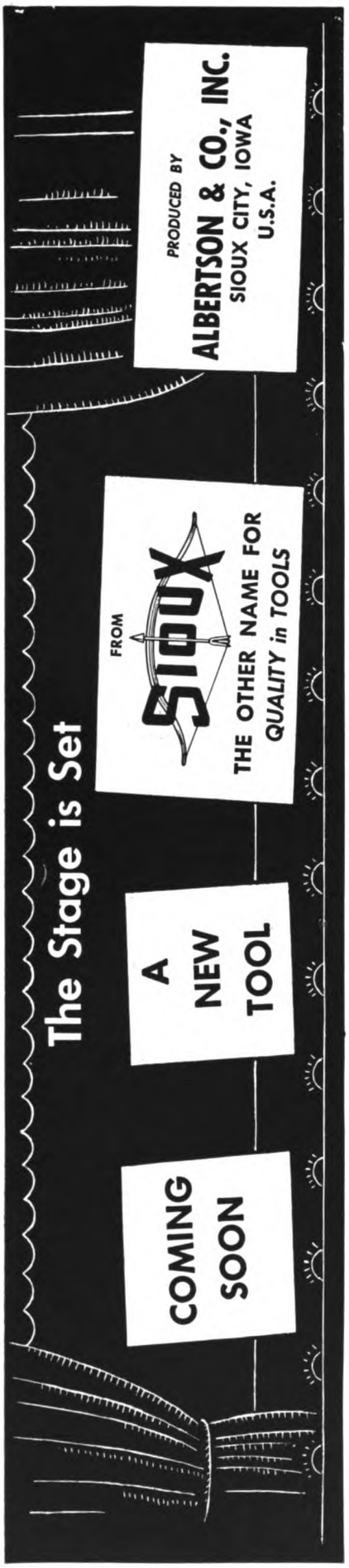
Especially designed to meet the demand for a safe, rugged, practical, light-weight truck for Box-Express Cars operating in passenger trains, this newest type COMMONWEALTH Equalized Swing-Motion Truck provides a *smoother riding car* with greatly reduced upkeep costs.

The swing bolster arrangement permits effective lateral control, assuring smoother riding with *less shock and damage to car contents*, car body and track structure. The one-piece cast steel truck frame, with integral pedestals machined, insures that the axles are kept in tram at all times, which is most desirable whether plain bearings or roller bearings are used. The COMMONWEALTH Trucks may be arranged for either clasp or single shoe type brakes.

For true economy and dependability it will pay you to apply COMMONWEALTH BX Trucks to your express, refrigerator and merchandise cars in passenger train service.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. • EDDYSTONE, PA.



Special Railroad Mount

Strand FLEXIBLE SHAFT GRINDERS

Designed for RR Shop Use

For grinding, sanding, rotary filing, wire brushing, drilling, deburring or polishing. With this new Railroad Mount, you take the Strandflex machine right to the work. You'll find it invaluable for a variety of different jobs in diesel shops, car shops. Promotes efficiency; workers lift only the tool—not the heavy motor.

Also Gasoline Powered Unit for Bridge or Maintenance of Way Depts.

All-purpose compact 5 hp. gasoline engine powered STRAND Flexible Shaft machine, governor controlled operating speeds from 2200 to 3200 rpm. Ideal for grinding rail welds, wire brushing before painting, smoothing concrete, etc. Makes you independent of electric power and air compressors.

Write for details on STRAND Flexible Shaft Machines specially designed for railroad use.

FRANKLIN BALMAR CORPORATION

Woodberry, Baltimore 11, Maryland
***Chicago Office:* 5001 North Wolcott Avenue, Chicago 40, Ill.**

EQUIPMENT

(*Continued from page 82*)

maintained. The tips retain their original shape as they do not erode or pit. They are furnished tinned ready to use.

All sizes of tips for each of the 40 types of Hexacon irons are stocked. *Hexacon Electric Company, 546 W. Clay avenue, Reselle Park, N. J.*

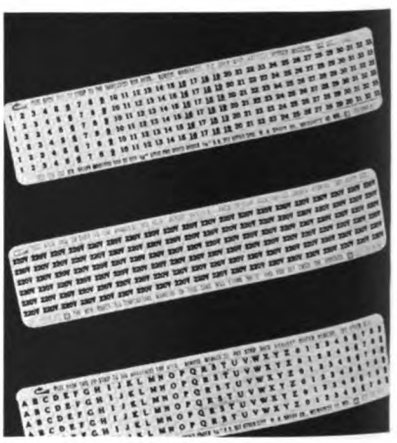
Carbon Remover Compound

Designed for heavy-duty use, either hot (150 deg F) or cold, as a tank-soak solvent to clean carbonaceous deposits, oils, asphalts, etc., from internal combustion engine parts, burner nozzles, diesels, etc.

When placed in use, a water layer of not more than 35 per cent nor less than 20 per cent of the volume of active compound should be added. Engine parts should be completely immersed beneath the bottom of the water layer while soaking. After soak, the parts should be drawn slowly through the water layer to rinse and then rinsed again in hot water or standard solvent.

The formulation contains both chlorinated solvent and cresols and must be handled with care to avoid personal injury or discomfort. Vapors should be conducted away from the cleaning area and away from workmen.

The compound, Type ECR-18, is packaged in 54-gal and 5-gal steel drums. *John B. Moore Corporation, P.O. Box 3, Nutley 10, N. J.*



High-Temperature Wire Markers

These all-temperature wire markers withstand continuous heat to 300 deg F, intermittent heat to 450 deg F, and continuous cold to minus 300 deg F, indefinitely.

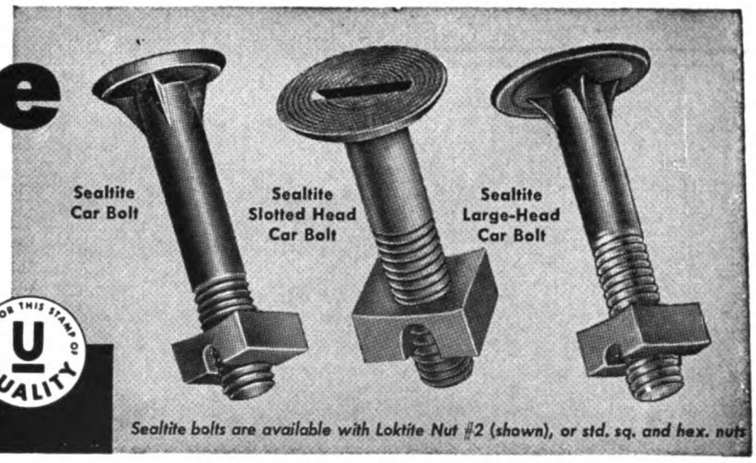
(*Continued on page 93*)

Lewis sealtite car bolts

All products are manufactured in the U.S.A. to A.S.T.M. specifications

More than 85% of America's Class I railroads use Lewis Sealtite products. Designed to do a better job . . . to last longer . . . to meet the most exacting specifications. Specify Hot Dip Galvanized, Zinc finish for Double-Life and economy.

All products are manufactured in the U.S.A. to A.S.T.M. specifications.



Sealtite bolts are available with Loktite Nut #2 (shown), or std. sq. and hex. nuts

Lewis BOLT & NUT COMPANY
504 Malcolm Ave. S. E.
MINNEAPOLIS 14, MINNESOTA

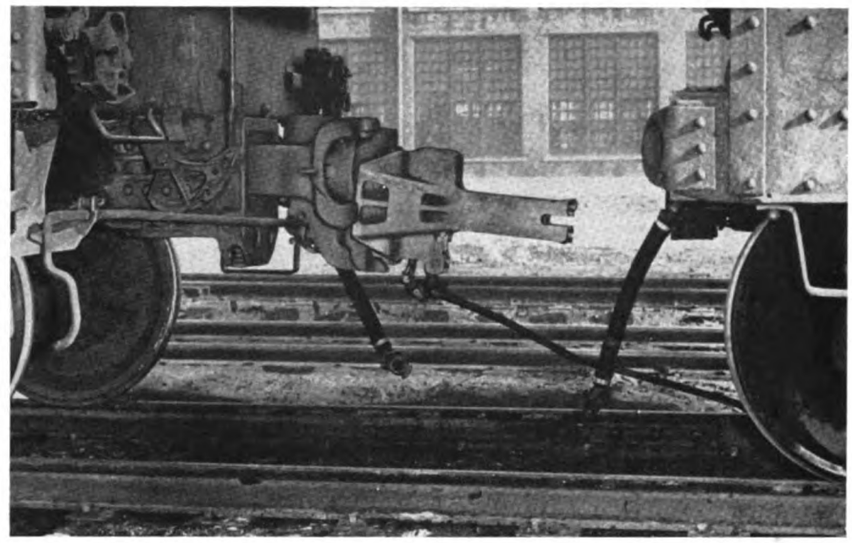
LOOK FOR THIS STAMP OF U QUALITY

(Continued from page 86)

Valuable in electrical maintenance work, the markers eliminate time-consuming wire notching, ringing out and costly errors due to improper connections. They provide, states the manufacturer, a method for legible identification of wires, circuits, motors, harnesses, coils, panels, etc.

The self-adhering markers are mounted on dispenser cards treated with a release coating. Markers themselves are treated with a silicone plastic overcoating which protects them from dirt, dust, grease, moisture and abrasion.

They are available in two sizes, 1½ in. long for wires over ¼ in. outside diameter and ¾ in. long markers for identification of small gage wires. Over 2000 different stock markers in a variety of letters, symbols and colors have been made available. *W. H. Brady Company, 727 West Glendale Avenue, Milwaukee 12, Wis.*



Interlocking Coupler

This Type F coupler has been adopted as an Alternate Standard by the AAR. It is similar to the Type H unit with aligning wings at either side of the coupler head. This feature prevents vertical slip-over during operation by retaining alignment of the couplers with each other.

Other features include the reduction of free slack to a minimum amount obtainable without machining. Restricted movement between mated coupler heads eliminates wear on the contour. New lockshift and anti-creep arrangements assure protection against unlocking. *Buckeye Steel Castings Company, Dept. 22, Columbus 7, Ohio.*

Plug and Receptacle

With only a screwdriver, the one-piece interior assemblies of these heavy duty, circuit breaking plugs and receptacles for portable electrical equipment outlets can be interchanged. They feature pressure connector wiring and take any size or type of portable cable up to a full 30-amp capacity at 600 volts a-c or 250 volts d-c.

Pressure connectors eliminate soldering, therefore wiring is accomplished quickly according to the manufacturer. The interior assemblies can be interchanged whenever it is necessary to make the plug the live member of two units. Since there are no exposed energized contacts, a dead receptacle may be safely fed from a hot plug.

Additional improvements include use of an aluminum alloy that resists corrosion and does not chip under heavy usage; insulation that has high-arc resistance and low-moisture absorption; and a cable entrance held tight by a rubber cable bushing clamped by a combination gland nut and strain relief clamp. The devices are designated series M54. *Crouse-Hinds Company, Wolf and Seventh North Streets, Syracuse, N. Y.*

Wiping Rags Cleaner

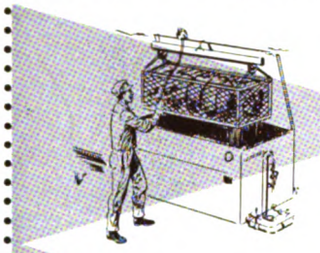
This single-package material, Composition No 75, is designed to eliminate the need for supplementary fillers or clay-type ingredients to assist regular washing compounds in removing heavy oil and grease from industrial wiping rags in machine washing

Don't TAKE YOUR CLEANING METHODS FOR GRANTED!

Some of them may cost too much in time and labor. Some may fall far short of the cleaning quality you need. Some may create unpleasant or even hazardous working conditions.

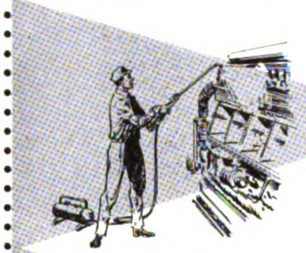
Re-Appraise! Compare!

Magnus Cleaning Methods for the railroad cover a wide range of operations. They are modern and field-tested. Most of them offer you material improvements in cost and effectiveness of cleaning over your present methods. For example . . .



Cleaning Diesel Parts

Magnus Aja-Dip Cleaning Machines and Magnus De-Carbonizing Cleaner can cut hand labor by 95% . . . time by at least 50% . . . cleaner costs by 60% or more.



Cleaning Diesel Engine Exteriors

Magnus Diesel Magnusol and two men will do a better cleaning job on a road unit in less than two hours than twice the manpower in more than twice the time.

For General Purpose Cleaning

Magnus 5RR is saving labor and time for a great many railroads on such diverse jobs as linoleum, floor, tile and washroom cleaning, removing stubborn head-liner dirt, cleaning coach interiors and diesel cabs. One deodorizing and disinfecting cleaner for many, many jobs.

Other Magnus Methods

. . . are at your service for cleaning A-Frames or blocks in record time . . . for cleaning trucks and underbodies . . . for engine pits . . . greasy concrete floors . . . signal and communications equipment . . . and virtually every one of your cleaning jobs, including fast, economical paint stripping.

USE THIS COUPON TO ASK FOR THE MAGNUS RAILROAD CLEANING MANUAL

magnus CLEANERS

Railroad Division

MAGNUS CHEMICAL COMPANY

77 South Ave., Garwood, N. J.

Please send us a copy of the Magnus Railroad Cleaning Manual.

NAME_____ TITLE_____

RAILROAD_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

operations. It is a light tan, free-flowing powder possessing a pine oil odor and offering excellent rinsability in hot water. It is added to the rag washing machine on the basis of weight of the load, with concentrations ranging from 1 to 2 lb per 100 lb of work, depending on degree of soil present. *Oakite Products, Inc., 146 Rector street, New York 6.*

PERSONAL MENTION

(*Continued from page 17*)

the C&NW. Soon after became assistant superintendent; in 1946, superintendent of the locomotive shops; in 1951, acting superintendent of motive power; then superintendent of motive power, Northern district, and in 1952, superintendent of motive power, system.

H. H. Magill

W. P. Miller, assistant superintendent motive power—diesels at Chicago, appointed superintendent motive power as announced in the November issue. Career: Became diesel supervisor of the C&NW in 1946; assistant supervisor of diesel and motor-car

W. P. Miller

New Air Brake Hose Lines Cut Costs 1/3 to 1/2

Aeroquip announces a new type air brake hose line designed especially for diesel-electric locomotive and passenger car application.

Rugged and durable, Aeroquip air brake hose lines provide substantial savings over conventional types, with no sacrifice in performance. The fittings are detachable and may be used repeatedly for making replacement lines. Hose and fittings can be purchased in bulk and assembled quickly using standard shop wrenches . . . an important feature that means quick maintenance and greatly reduced inventory.

Some of America's leading railroads have already standardized on Aeroquip for replacement lines with anticipated savings of many thousand dollars. You can do the same . . . write for complete information.

For all Diesel-Electric Locomotives and Passenger Cars

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

GARLOCK REPLACEMENT PARTS

Gaskets—Packings—Molded Rubber Rings for diesel locomotives . . .

Section of Garlock's diesel parts stock room

NOW pre-stocked in handy packages, ready for immediate shipment

Packaging and labeling diesel parts after inspection.

GARLOCK diesel replacement parts —gaskets, packings and molded rubber rings—are packaged in convenient quantities for ease in handling, storing and redistribution to shop men, overhaul shops and terminal points.

All packages are labeled for instant identification—no cross-reference parts list needed.

Garlock diesel gaskets, packings and molded rubber rings are giving completely satisfactory service on leading railroads. Specify Garlock diesel replacement parts and write us for complete parts-and-price list.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.
Branch Offices in Most Principal Cities

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

equipment in 1947; supervisor in 1949; assistant to chief mechanical officer in 1951, and assistant superintendent of motive power—diesels in 1952.

W. W. MATZKE, chief mechanical engineer at Chicago, appointed assistant superintendent motive power as announced in the November issue. Career: Began with the C&NW in 1944 as an engineer of power plants and machinery. In 1947, appointed mechanical officer; later in 1947, assistant

W. W. Matzke

to the vice-president in charge of mechanical matters; in 1948, assistant to chief mechanical officer, and in 1954, assistant superintendent of motive power.

E. H. WESTON, assistant chief mechanical engineer at Chicago, appointed chief mechanical engineer as announced in the November issue. Career: Started with the

E. H. Weston

C&NW in 1939 as a tracer in the drawing office. In 1941 appointed draftsman; in 1945, leader of locomotive and car draftsmen; in 1947, mechanical engineer; and in 1951, assistant chief mechanical engineer.

L. A. KLEMT, appointed mechanical engineer, Chicago shops.

Obituary

A. E. VOIGHT, formerly car lighting and air-conditioning engineer, Atchison, Topeka & Santa Fe, died on December 5 at the age of 69.

SUPPLY TRADE NOTES

JOSEPH T. RYERSON & SON.—*C. D. D'Amico* has been named manager of sales at Los Angeles. Mr. D'Amico was formerly manager of the stainless steel department there.

■

CANADIAN CAR & FOUNDRY CO.—*Henry M. Viberg* has been appointed chief mechanical engineer at the Longue Pointe plant.

■

NATIONAL CARBON COMPANY.—*Muscoe Burnett, Jr.*, has been appointed vice-president of National Carbon, a division of Union Carbide & Carbon Corporation. Mr. Burnett was vice-president of Oxweld Railroad Service Company until recently, when its operations became part of the Linde Air Products Company.

M. Burnett, Jr.

■

NATIONAL PNEUMATIC COMPANY.—*Edward J. Carey* has been appointed sales manager for the transit and railroad division of National Pneumatic Company and Holtzer-Cabot Divisions. He was formerly sales engineer in the New York branch office.

E. J. Carey

A. M. BYERS COMPANY.—*John J. Sayles* has been appointed field service engineer in the Cleveland area of the Pittsburgh division at Cleveland.

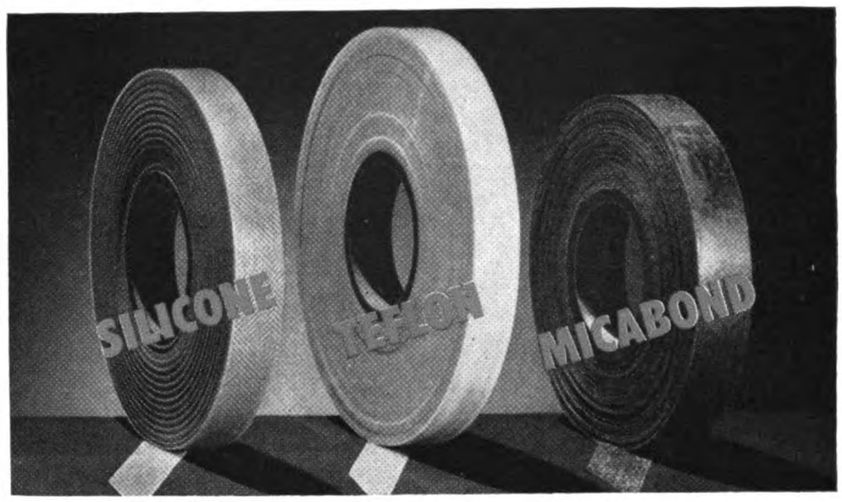
■

YOUNGSTOWN SHEET & TUBE CO.—*E. S. Steigner*, metallurgical engineer in the research and development department has been appointed supervisor of the newly organized service engineering department.

John M. Tuthill, formerly assistant general manager of sales, has been appointed general manager of sales. Mr. Tuthill, who was in the firm's Chicago office, has transferred to the main office in Youngstown, Ohio. *John P. DeHetre*, who was appointed an assistant general manager of sales last June, with office in Youngstown, has been transferred to Chicago to succeed Mr. Tuthill, *P. G. Boyd*, formerly Chicago district sales manager, has been promoted to the newly created position of Western manager of sales. *C. Hix Jones*, Detroit district sales manager, succeeds Mr. Boyd at Chicago, and *David H. Goodfellow*, assistant Detroit district sales manager, succeeds Mr. Jones.

■

AIR REDUCTION SALES COMPANY.—*D. J. Williams*, manager of the western region of railroad sales, has been appointed manager of the railroad depart-



Three CDF TAPES to meet your heat and electrical insulating needs

C-D-F Silicone Tapes for A.I.E.E. Class H Electrical Insulation. Available in Varnished Fiberglas cloth and Silicone Rubber-coated Fiberglas cloth. Resistant to high temperatures; high dielectric strength, low dielectric losses, excellent moisture resistance and high tensile strength. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated solvents. Available in a range of sizes on continuous rolls. Write for Technical Bulletin #47.

C-D-F Tapes of Teflon* have the desired mechanical and electrical properties for heavy duty motor, generator, and conductor insulation. Unaffected by temperature fluctuations, exposure to oils and greases, or weather conditions. Fiberglas supported and unsupported Teflon tapes are available in a range of sizes.

C-D-F Micabond Tapes have an inherently high and permanent resistance to heat with good dielectric properties. Micabond Tapes are used for insulating motor and generator armature and field coils, turbogenerator coils, and many similar applications where flexible high quality insulation of A.I.E.E. Classes B and H insulators are required. Available in a wide range of sizes with many different backings including: fiberglas, silk, Cellophane*, cotton, paper, and Mylar*.

If you have an insulating problem, probably a C-D-F product is the answer. C-D-F manufactures and fabricates electrical insulation, laminated and molded plastics. Sales offices are located in principal cities. Call your C-D-F sales engineer—he's a good man to know!

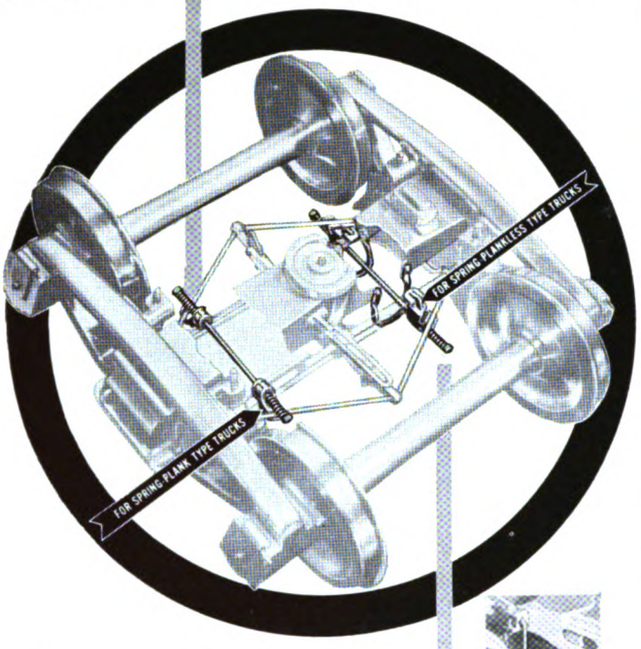
*du Pont trademarks.

CDF Continental-Diamond Fibre

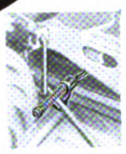
CONTINENTAL-DIAMOND FIBRE COMPANY
NEWARK 104, DELAWARE

in your rebuilding program

the GRIPCO Brake Beam Safety Support



gives added safety at minimum cost



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D. J. Williams

railroad sales and, following service in the United States Navy, became western manager, railroad department.

■

UNITED STATES RUBBER COMPANY.—*G. Allen Lovell*, sales manager of manufacturers' products, has been elected assistant general manager of the mechanical goods division at New York.

■

J. A. ZELLE COMPANY. — The J. A. Zelle Company, 842-50 Atlantic Street, Bridgeport 4, Conn., has been organized for the manufacture of railway hardware. *M. A. Roberts*, who was formerly vice-president in charge of railway engineering and sales of the Barnaby Manufacturing Company, will be in charge of sales.

■

PULLMAN-STANDARD CAR MANUFACTURING COMPANY. — *R. E. Schooley* has been named assistant vice-

R. E. Schooley

president in charge of southern sales at Birmingham, Ala., to succeed *Fred O. Reemer*, vice-president in charge of southern sales, who has retired.

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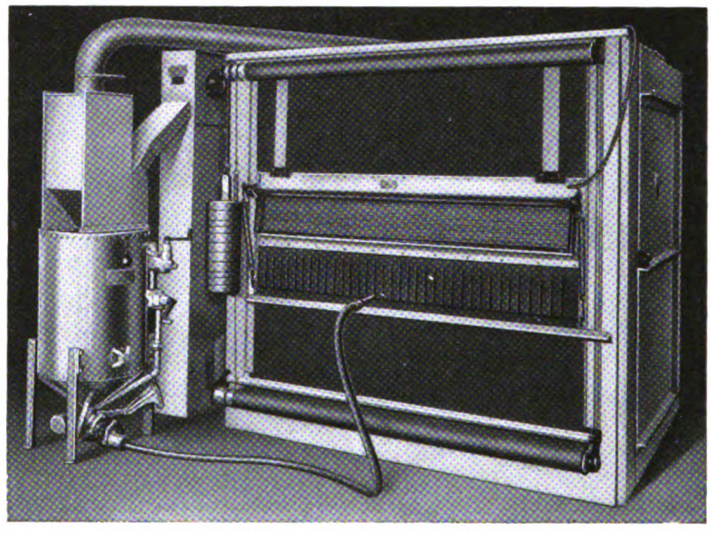

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for your wonderful response

This message first appeared in Railway Age in December 1953. Since then, we have had a most gratifying response from both management and individual railroad employees, many of whom are giving freely of their own time to promote better community relations for our industry. We, here at BUFFALO, will continue to raise our small voice during the coming year.

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Founded in 1832 as the American Rail-Road Journal

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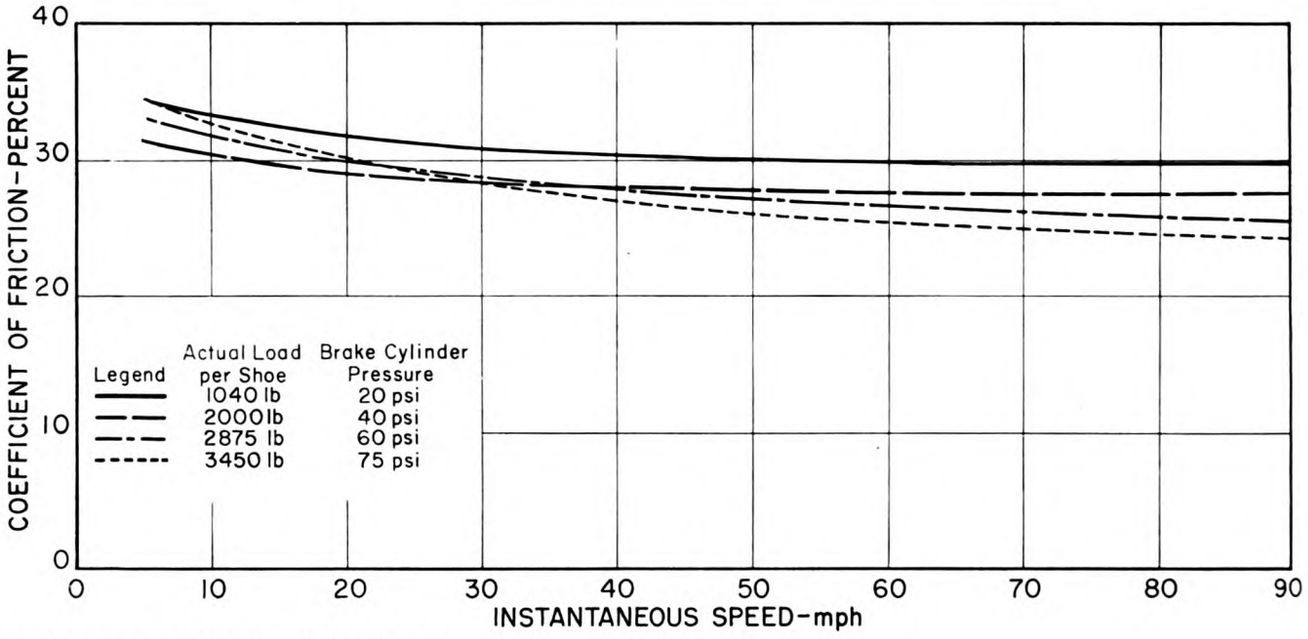


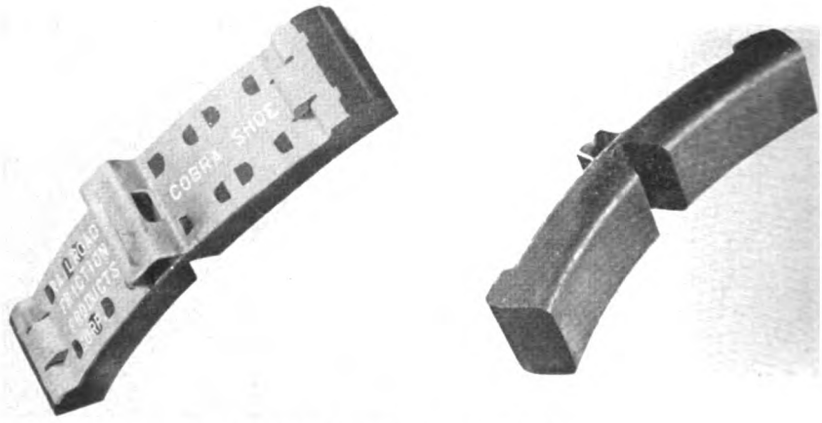
How the coefficient of friction of the Cobra Shoe varies with instantaneous speeds.

A High-Friction Wheel-Tread Brake Shoe

After six years of intensive research to develop a brake-shoe material possessing a high and uniform coefficient of friction, high resistance to wear, strength adequate to prevent disintegration in service and causing a minimum of wear and thermal effect on the tread of the wheel, the Westinghouse Air Brake Company and the Johns-Manville Corporation, as announced in the Supply Trade item on page 92 of this issue have formed the Railroad Friction Products Corporation to produce and market a tread type brake shoe of a new material which meets these specifications. The brake shoe, known as the Cobra Shoe, is pressure moulded of a composition friction material in an organic binder on a steel back and is interchangeable with iron shoes in standard brake heads. Its weight is slightly less than one half the weight of an iron shoe.

As indicated in the graph, the Cobra Shoe has a coefficient of friction on the tread of a car wheel which is relatively flat throughout the speed range, but rises slightly at low speeds. The slope of the curve, however, is so flat that there is no marked increase in deceleration at the end of a stop and the characteristic lurch at the end of a stop with the brakes fully applied is minimized. Because of this characteristic, it is unnecessary to employ speed governor control for high-speed braking on passenger cars.

The cofficient of friction of the Cobra Shoe is approximately four times that of the cast-iron shoe. This high-friction characteristic permits the use of cylinders of one half the diameter which give one fourth of the force values normally used for comparable stopping distances with cast-iron shoes. Deceleration values are unaffected by water.



The Cobra Shoe is moulded under pressure on a steel back.

For new passenger cars, it is estimated that the Cobra Shoe will permit a weight reduction of about 3,000 lb. The reduced stresses caused by the lower braking ratio will permit the design of lighter truck side frames and weight can be saved in the brake rigging and in the brake shoes, themselves. For application to existing equipment, little change is necessary except in the size of brake cylinders.

Experience with more than 36,000,000 brake-shoe miles indicates a Cobra Shoe life of about three times that of cast-iron shoes. Wheel wear is also reduced. The Cobra Shoe wears evenly and produces a highly polished wheel tread. In subway service the result has been a noticeably quieter ride and an absence of noise and vibration when the brakes are applied.—*Railroad Friction Products Corporation, Wilmerding, Pa.*

Fire Extinguisher Cart

This cart is a device for stationing various combinations of dry chemical, carbon dioxide and vaporizing liquid type extinguishers at their strategic locations and for transporting them quickly to the scene of the fire. There is no lifting from wall hangers. It is said to be of great advantage where women are trained to operate extinguishers.

The cart is useful when it is necessary for one man to fight a fire. He is able to transport three extinguishers instead of one. Height of the extinguisher hanger is adjustable so that the cart may be made to hold a variety and types of extinguishers.

Height is 46 in.; floor space required, 14 by 21½ in., and diameter of wheels, 10 in. The cart is finished in a black enamel body and red enamel wheels. *American-La-France-Foamite Corporation, Elmira, N.Y.*

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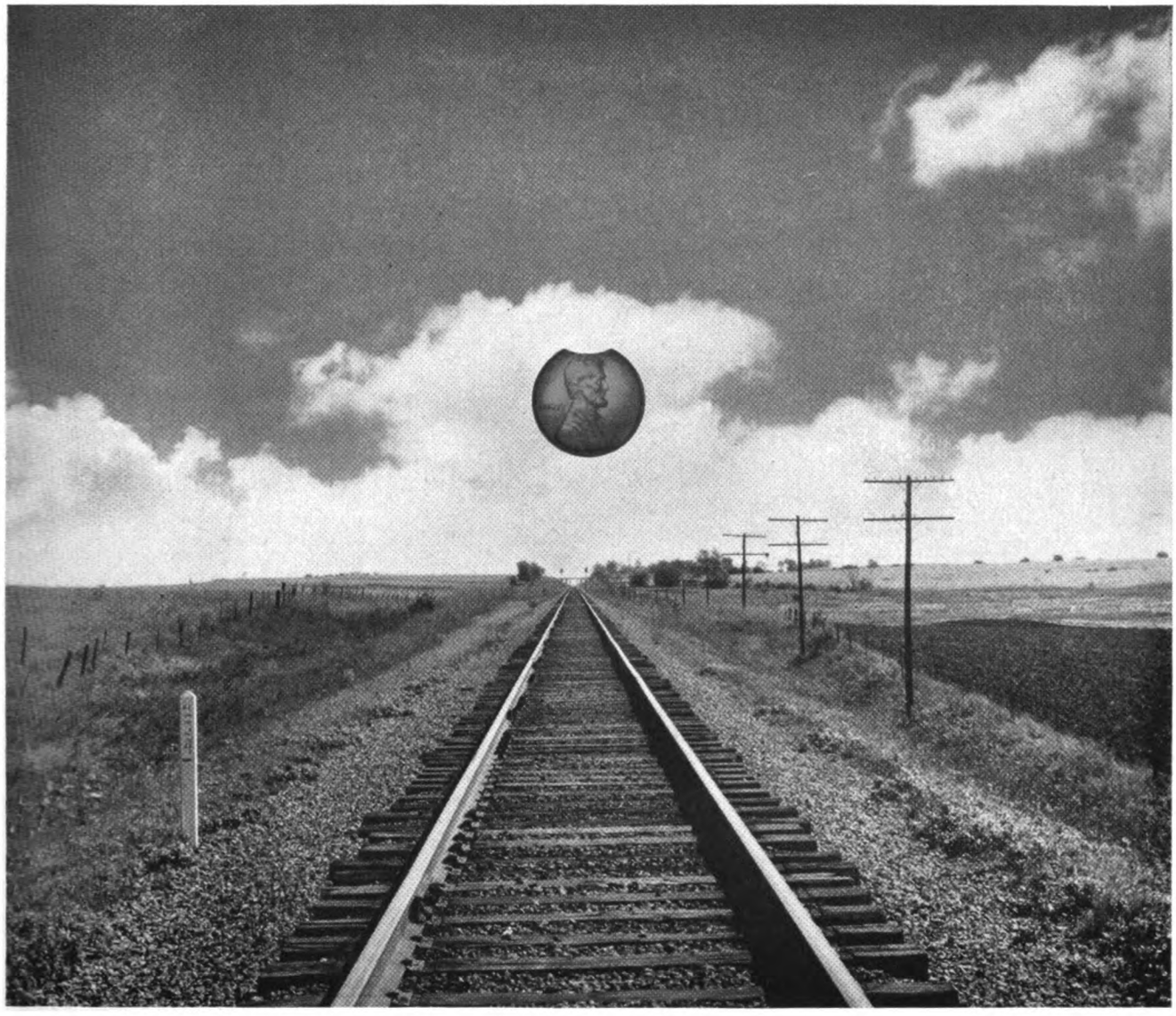

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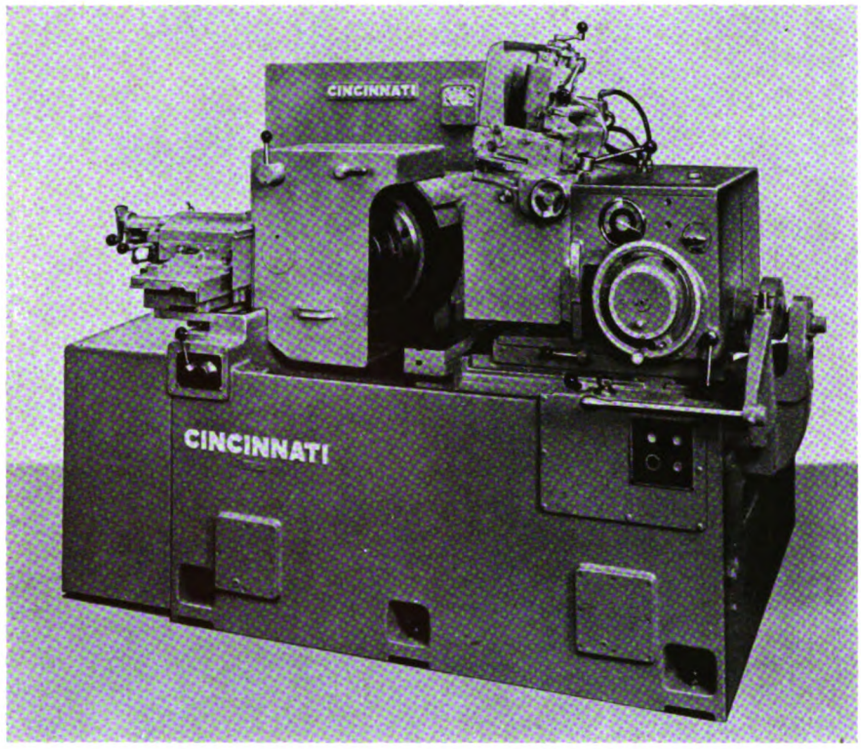


Centerless Grinding Machine

Designated the No. 2, this centerless grinding machine is more than 1000 lb heavier than its predecessor and incorporates many new features. Filmatic bearings have been retained for the grinding wheel spindle. They are self-adjusting for all conditions imposed by the grinding action; automatically lubricated with filtered oil from a circulating system, and protected with an electrical pressure switch.

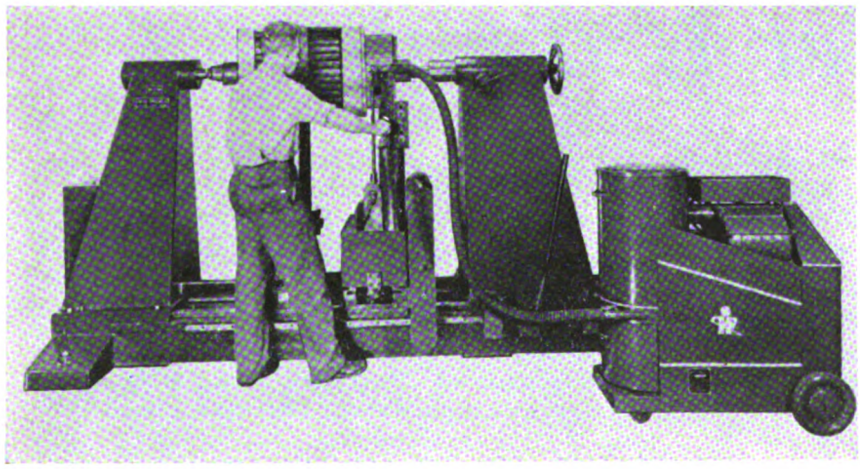
A lower slide unit, mounted on bed ways at right angles to the grinding wheel spindle, supports an upper slide unit which carries the regulating or feed wheel. Way bearing surfaces are well guarded to exclude grit and cutting fluid. To compensate for slight errors in truing or in setup, the entire regulating wheel pile may be swiveled slightly on the bed.

The regulating wheel is driven by a built-in 1½-hp motor through a back gear combination and a wide V-belt. Regulating wheel speeds are infinitely variable, within two ranges, from 11 to 320 rpm. Speed changes are accomplished with variable pitch sheaves, handwheel selected and indicated on a large tachometer dial at the operator's working position.

Power operated profile truing is standard equipment for the grinding wheel. It is actuated by a hydraulic motor at one end of the unit. Two external controls are located on the operating side of the bed, one to engage rapid and truing rates and change the direction of traverse, and the other control to change the rate of traverse.

The infeed handwheel for size adjustment and positioning the slides when setting up the machine is located on the upper slide, at the operator's working position. It incorporates a 0.0001 in. graduated dial and a 0.001 in. graduated dial. The motor and electrical controls are completely enclosed and the device is wired to comply with J.I.C. standards. Push-buttons are located on the front of the bed and electrical controls are contained in a sheet metal unit at the rear of the machine, equipped with a safety interlock and a loadmeter to show percent of available grinding wheel horsepower being used during the grinding cycle.

A wide variety of standard fixtures and attachments are available. Included among them are several types of work rests, long bar grinding attachments, automatic electro-hydraulic and roto-infeed attachments, automatic and hand grinding wheel spindle reciprocation, feedmatic hoppers, etc. *Cincinnati Grinders, Inc., Cincinnati 9.*



Undercutter With Sensing Head

The Type M sensing head has been developed for use in conjunction with the type DS undercutter for the purpose of converting the device into a fully automatic machine for slotting of free end commutators. When attached to the undercutter, the device acts on the commutator to locate the mica segment for alignment with the cutting saw by exercising control over a power rotator which turns the armature being serviced.

The type DS undercutter is primarily designed for use in a diesel repair shop for undercutting commutators of traction motor and generator armatures. The unit will support armatures having a maximum diameter of 60 in. with a maximum shaft length of 72 in. and a maximum weight of 9,000 lb.

The basic principle on which the automatic sensing device operates is that a circuit is established through the commutator by employing a carbon brush which spans a number of bars for establishing a common contact. A pointed element bearing on the commutator surface is designed to break a relay circuit when, with the armature turning, a mica segment passes under the point. With the relay circuit broken, the armature rotating motor is caused to stop. Hence, with the stopping point located so that a mica segment will come to rest directly in line with a cutting saw, it becomes possible.

(Continued on page 16)

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"Chessie" has long been a symbol of smooth, safe travel on crack C&O passenger fleets. Today, more than ever before, the same applies to their freight service.

Current modernization on the C&O calls for bringing some 6000 older cars up to modern riding standards with ASF Ride-Control Packages. Result: *cars that ride over fifteen times more smoothly!*

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In deciding to use Packages extensively, the C&O considered the fact that a car available only for restricted use represents a potential revenue loss . . . that a more efficient car pool is the answer to carrying more freight per dollar invested in rolling stock . . . that safer hauls at higher speeds build traffic.

Not *all* older cars are equipped with Packages, of course. Some are so close to retirement that they don't justify even this small an investment. So each older car is evaluated as to its over-all condition. In short, the C&O Package program is sound economics in *practice* as well as in theory.

Would a similar program be practical on your road? *The facts prove that it's worth investigating.* Now is the time to find out why a small per-car investment in Ride-Control Packages can pay you big returns!

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AMERICAN STEEL FOUNDRIES

410 N. Michigan Avenue, Chicago 11, Illinois

Canadian Sales: International Equipment Co., Ltd., Montreal 1, Quebec

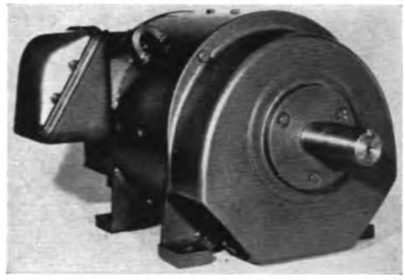
"Engineering in Steel—Engineers' Week—February 20-26"

(Continued from page 10)

through a relay circuit, to have the cutting saw make a traverse between limits for the purpose of removing the mica between the copper segments.

The distance that the cutting saw will travel is controlled by the positioning of the carriage on the ways of the machine and an adjustable stop which is clamped on one of the ways.

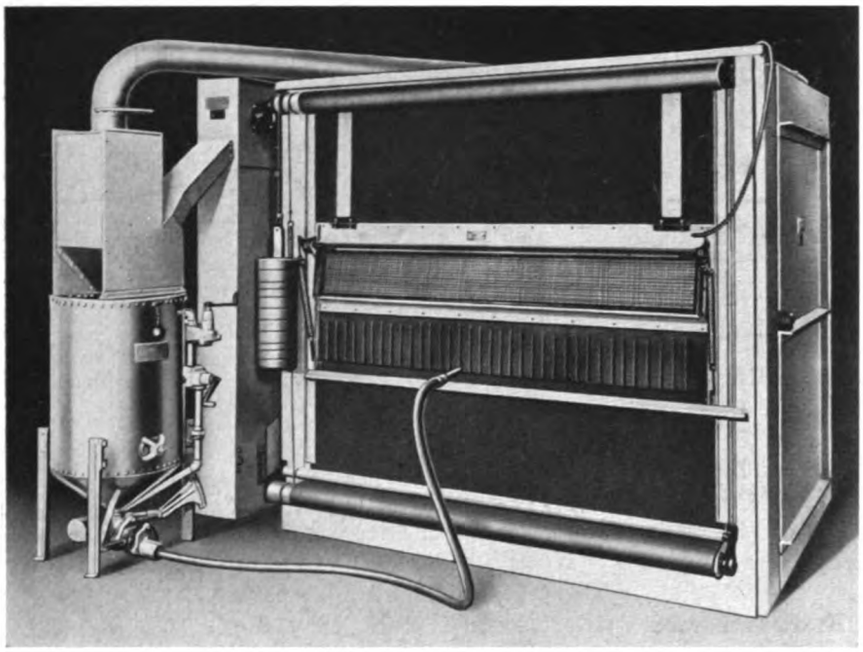
The head consists of a 2-in. sq aluminum tube which carries on the commutator a series of contacts designed for establishing an electrical circuit through the commutator which controls the rotation of the armature. Sequence of operations is controlled by a relay network with relay elements designed to be mounted on the undercutter in a metal enclosure. *Electric Service Manufacturing Co., 17th and Cambria Streets, Philadelphia 32, Pa.*



trolled reaction of the motors to the demand for a change with a dynamic response formerly found in specially designed machines is standard of performance.

Dynamic response is described as the fundamental feature of the unit. It also features ruggedness, ability to take full loads and overloads, ability to change speeds rapidly, ability to maintain torque and tension, and reverse and stop quickly.

The line is produced in sizes from 20 to 100 hp, and the range will be extended both upward and downward to lower and higher horsepowers. A complete line of mechanical enclosures has been developed to assure complete protection under severe operating conditions. *Reliance Electric and Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio.*



Armature Cleaning Machine

An armature cleaning machine now being made for the railroads utilizes a shelblast abrasive to clean the rotors and other parts of motors and electric generators for diesel locomotives while undergoing repairs. The equipment illustrated includes a sanitary-type steel room, with operator's protective curtain, and fitted with three 150-watt electric lights. This apparatus completely encloses the soft grit shelblasting operation and affords the operator complete accessibility to the work, adequate illumination on the blast zone, as well as full protection from rebounding abrasive.

The primary blasting unit includes a direct-pressure generator, compressed air operated, which delivers crushed walnut shell through a 1-in. supply hose to a 5/16-in. discharge nozzle. The operator directs the nozzle at the diesel armatures through the protective curtain shown.

The discharged shelblast compound falls to the floor, enters a V-shaped hopper where a mechanical screw conveyor picks up the material, passes it through a screening device and automatically recharges the blast generator with shelblast compound. This continuous operation assures a continuous supply of shell compound to the nozzle.

The dust and dirt created by the shelblasting operation is removed by means of a Ruemelin No. 755 tubular cloth-type dust filter, connected by suitable piping to the blast room and elevator system. A fan, driven by a 5-hp motor, keeps the entire blasting operation under negative draft at all times. The dust filter suppresses all fine dust particles. This shelblasting equipment is said to eliminate the use of obnoxious and toxic cleaning fluids, and effect appreciable time and labor savings. *Ruemuelin Manufacturing Company, 3861 N. Palmer street, Milwaukee 12.*

Industrial D-C Motors

These new motors are described as producing the fastest and most accurate response ever offered in a standard design unit, and are reported to be twice as effective in many applications as any other motor now produced. Called the Super T, the con-

Fire Extinguisher

Designed for industrial use, this device is capable of expelling 10 lb of dry chemical against fires in flammable liquids, gases, chemicals and electrical equipment. Its light overall weight of 22 lb, and simplicity of operation makes it suitable for use by inexperienced personnel according to the manufacturer.

Designated the Ansul 10, it should fill a need for an extinguisher with a capacity between the manufacturer's 4 lb and 20 lb capacity models. The unit is equipped with a CO_2 pressure cartridge to activate discharge of the dry chemical. Other design features include a fill cap that is considered more effective in keeping moisture out of

(Continued on page 88)

The modern Chesapeake and Ohio Railway uses the modern Diesel Locomotive Lubricant—

GULF DIESELMOTIVE OIL

Over $460 million has been put into plant improvements since the war to make the progressive Chesapeake and Ohio one of the most modern railroads in America. The modernization program includes a system of centralized traffic control, new mechanical track maintenance equipment, and additional powerful Diesel locomotives.

Many of the C&O's modern Diesel locomotives are lubricated with Gulf Dieselmotive Oil—the modern Diesel locomotive lubricant that contributes to better performance, greater availability, and lower maintenance costs.

Here's why:

1. Effective detergent action prevents harmful piston ring belt deposits.
2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.
3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Write, wire, or phone your nearest Gulf office today for this expert lubrication assistance.

Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PA.

GULF

Solid bearing freight cars give

$250,000 EXTRA

on each 1000-car

You get from 6.25% to 10% more income from your investment when cars are solid bearing equipped—regardless of traffic conditions.

ALL labor and material costs for solid bearing operation, including overhead expense, come to less than the fixed charges on the huge investment necessary for non-standard bearings. That's established when you analyze the University of Illinois study of journal bearing operation* in the light of high initial roller bearing costs.

But the University also included costs for car delay days, based on problematical earnings and ownership costs. According to the University, the earnings presumed to be lost because of delay days constitute a significant percentage of the total costs for solid bearing operation.

How Problematical Earnings Prove The Case for Solid Bearings

When you talk about problematical earnings, you've got to relate them to *return on a prospective investment*, and not just to costs for an investment already made. That's the basis for all sound business procedure. Let's look at a case in point.

Suppose you're an average railroad with a given amount of money you can spend for *needed* freight equipment now. Say that the money you have is $6,600,000.00.

Now let's further suppose that the average freight car costs $6,000.00, and that this car could be equipped with roller bearings for only $600.00 additional. For the money on hand you could then buy 1100 solid bearing cars or 1000 roller bearing cars.

Do you want to know what the *loss* on the roller bearing investment would be? Here's a rule-of-thumb to figure it. Still assuming these 100 extra cars are needed, each of them will produce annual revenue of $4,000.00,** or a total of $400,000.00 per year. Then from this sum you subtract the difference, if any, in maintaining and operating journal assemblies on 1100 solid bearing cars as opposed to 1000 roller bearing cars.

Applying the Rule-of-Thumb to a 1000-Car Investment

But the costs for roller bearing maintenance and operation on freight cars are unknown. However, from the University of Illinois report we learn that solid bearing operating costs (including all delay day costs for periodic maintenance and train inspection, as well as hot boxes) range between $7.59 and $8.53 per 1000-car-miles.*** If each car accumulates 16,800 miles per year, maximum annual solid bearing operating costs would be $8.53 x 16.8 x 1100, or $157,634.40. Thus, your *minimum annual loss* on 1000 roller bearing cars would be $242,365.60 ($400,000.00 less $157,634.40) *plus* the annual expense for skilled labor and materials for roller bearing maintenance on 1000 cars, and *plus also* any loss of revenue sustained because of delay days due to roller bearing failures, maintenance and inspection, etc. Conservatively, if you specify solid bearings you gain from $250,000.00 to $400,000.00

*University of Illinois Engineering Experiment Station, Bulletin Series No. 406: An Economic Investigation of Solid Journal Bearing Operation in Freight Service on Two Large Class I Railways; February, 1953.

**According to American Railway Car Institute, average revenue per freight car in 1953 was $4,351.00, and the average cost of all maintenance per car, including journal assemblies, was $350.65.

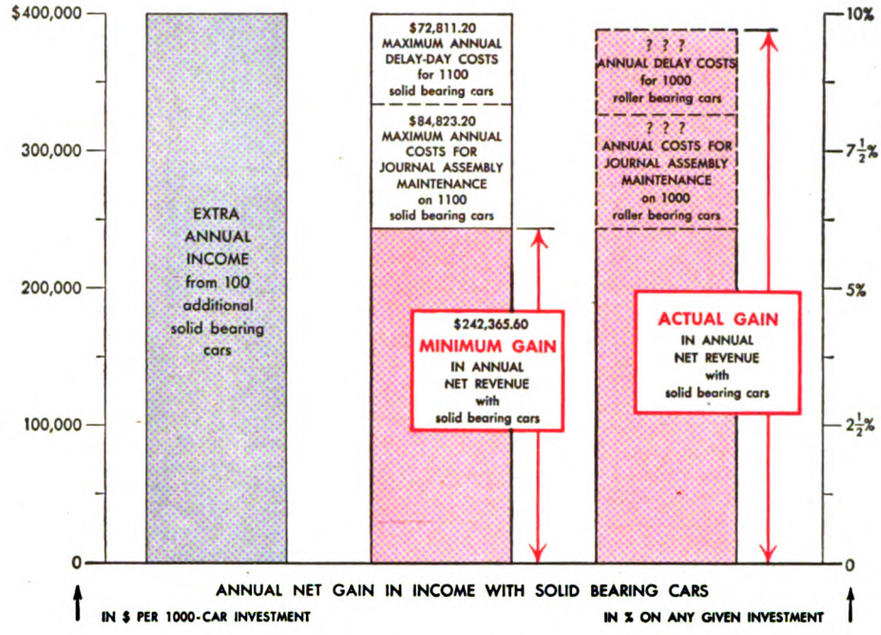
***These costs, while used here, are probably too high. See Magnus Bulletin No. 2068-68.

equivalent of

REVENUE PER YEAR

investment

The left-hand column shows the average extra annual revenue that can be obtained by buying 1100 solid bearing freight cars instead of 1000 roller bearing cars. The middle column graphically subtracts from this extra revenue all solid bearing operating costs on 1100 cars, and the remainder represents the minimum gain in net revenue that would result if roller bearings could eliminate all maintenance, delay, and failure costs. To determine the actual annual net gain, this minimum net gain should be increased by the unknown amount of the costs for roller bearing operation on 1000 cars, as indicated in the right-hand column. The reference line at the right indicates the percentage increase in return with solid bearings that can be anticipated for any given car investment.



for each year of operation, increasing your income at least 6.25% and possibly as much as 10%.

By the same token, suppose you only need 1000 cars to meet your traffic requirements. With solid bearings, you reduce your initial costs by $600,000.00 and you get the same proportionate increase in return per dollar of car investment represented by the $250,000.00 to $400,000.00 above. And since both freight revenues and bearing operating costs are proportionate to car use, this comparative increase in return with solid bearings holds true regardless of traffic conditions.

These hard economic facts prove the wisdom of present railroad policy to seek out and adopt the means for bettering solid bearing performance. For the most part these means are already available. Combine selective adoption of available developments with a program to improve maintenance standards and hot boxes will virtually disappear.

Write us for information about ways to improve journal bearing performance. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

MAGNUS

Solid Bearings

Right for Railroads

...in performance...in cost

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

NEWS

Vaughn R. Hawthorne

William M. Keller

Keller Succeeds Hawthorne

William M. Keller, director of research, Mechanical Division, Association of American Railroads, has become the division's executive vice-chairman and director of research. As vice-chairman he succeeds Vaughn R. Hawthorne, who retired December 31.

Mr. Keller, a native of Pittsburgh and an engineering graduate of Pennsylvania State College, entered railroad service in 1919 as apprentice machinist with Pennsylvania. In 1945, he was promoted to assistant mechanical engineer in charge of research. He joined the AAR in 1952.

Mr. Hawthorne, who retired after more than 50 years in the railroad industry was honored at a December 3 luncheon at the Union League Club in Chicago. The luncheon, sponsored by a large group of midwestern supply men, also was attended by many representatives of the Mechanical Division and members of the Locomotive Maintenance Officers Association.

Mr. Hawthorne, 68, entered railway service with the Pennsylvania in 1904. He was appointed acting secretary of the Master Car Builders and the American Railway Master Mechanics Associations in 1918. From 1919 to 1940 he was secretary of the Mechanical Division, and in 1941 became executive vice-chairman.

Metallizing to Build Up Axles Gets ICC Frown

The Interstate Commerce Commission has indicated its view that use of "metallizing" to build up worn axles is akin to use of fusion welding, which is a method of reclamation "not in accordance with recognized practice of the Association of American Railroads."

The commission has also suggested that the "severe service conditions" to which axles and wheels on diesel-electric locomotives are subjected may well point up "a need for more frequent testing and determination of a safe life expectancy for such axles."

These expressions of the commission were in a report (No. 3594, by Commissioner Clarke) on its investigation of the September 22 derailment of the Santa Fe's Train No. 2, the "San Francisco Chief," near Orwood, Cal. The commission found that a broken axle caused the accident, which resulted in injury to 40 passengers, 18 dining-car employees, and one train-service employee.

The axle was part of a driving-wheel set on the third unit of the train's four-unit diesel-electric locomotive. The break which caused the derailment was at one of the journals, and the axle was also cracked in the adjacent wheel seat. Laboratory tests of the axle material "indicated that the chemical composition met the specification requirements, but the yield strength was below the minimum specification requirement," the commission said.

Since it had first been placed in service, wheels had been remounted on the axle four times, the last at 994,373 miles of service. "The failed journal," the report said, "had been built up by use of the metal spraying process which extended into the fillet. This metallizing had broken from the axle surface near the fractured face." In either the metallizing or fusion-welding processes, the report said, "concealment of any existing surface defects is equally effective."

Meanwhile, however, the commission conceded that its investigation in the present case left it unable to determine whether

E. L. WOODWARD (left) **is now Pacific Coast editor,** ***Railway Locomotives and Cars,*** **at Los Angeles, Cal. G. J. WEIHOFEN** (right) **succeeds Mr. Woodward as western mechanical editor at Chicago. Mr. Woodward, a graduate of Massachusetts Institute of Technology (B.S. in E.E. 1911), started his railroad career on the Boston & Maine and worked on the New York Central before coming with Simmons-Boardman as associate editor,** ***Railway Mechanical Engineer*** **(now** ***Railway Locomotives and Cars*****). For two years (1918-19) he was with the Railway Engineers Corps, U.S. Army, and since 1923 has been western mechanical editor at Chicago. Mr. Weihofen, a graduate of Purdue University (B.S. in M.E. 1940), was with the Erie for three years and came to Simmons-Boardman in 1946 as associate editor,** ***Railway Mechanical Engineer*** **after three years' in the U. S. Navy.**

there were any incipient defects at the time the metallizing was applied.

The "recognized practice" of the AAR to which the report referred is the rule that condemns restoring worn-out axles to original size by welding with the exception of building up the end collars). Also cited was a previous commission pronouncement which called use of fusion welding on axles a "pernicious practice." The suggestion that axles on diesels should be tested more frequently came at the end of the commission's report, preceded by this comment:

"The axle which failed had during its service life had five pairs of wheels mounted upon it and had accumulated nearly one and one-third million service miles prior to failure. Development of the progressive fracture that culminated in failure of the journal and of the progressive fracture in the adjacent wheel seat strongly indicates that the axle had been continued in service beyond the endurance limit of the metal."

Southern To Enlarge Hayne Car Shop

The Southern will spend $1,500,000 to enlarge and improve its box-car rebuilding facilities at Hayne Car Shop, near Spartanburg, S. C.

Lester N. Selig Elected President of Car Institute

The American Railway Car Institute has elected Lester N. Selig, of Chicago, as president. Mr. Selig, who will serve without compensation, succeeds Gustav Metzman, who has retired after serving two years as full-time head of the institute.

The new president of ARCI has spent his entire business life with General American Transportation Corporation. A native of Brooklyn, he began as a workman in the shops of the company of which he is now chairman of the board.

Diesel's Fuel-Cost Showing Still Tops

Diesel-electric freight locomotives in 1954 produced 80% more gross ton-miles per dollar of fuel expense than coal-burning steam locomotives or electrics. On the same basis, the diesels' output was nearly three times that of oil-burning steam locomotives.

That showing was indicated by figures for the first nine months of 1954 which were published in the "Monthly Comment" of the Bureau of Transport Economics and Statistics of the ICC.

The nine-months' figure for diesels showed that they produced 5,371 gross ton-miles per dollar of fuel expense. Comparable figures for other types of motive power were: Coal-burning steam locomotives, 2,952; oil burners, 1,849; electrics, 2,903.

The 1953 figures were higher for all types of motive power except coal burners. The bureau explained that this reflected "in no small degree" changes in the unit cost of fuel. Only coal, down 2.2% from $5.52 per net ton to $5.40, was cheaper in 1954 than in 1953. Fuel oil was up 18.8%, from $1.65 per barrel to $1.96; diesel fuel rose 1.7% from 9.9 cents per gallon to 10.07 cents; and electric current was up 6.8%, from 1.088 cents per kilowatt hour to 1.162 cents.

The bureau's figures also showed that diesels performed 84.2% of the freight service (as measured by gross ton-miles) on Class I railroads in the first nine months of 1954. That was an increase from 73.9% in the first nine months of 1953. Meanwhile, the coal burner's share was down from 19.2% to 11.8%, the oil burner's share dropped from 5.1% to 2.1%, and the electric's share was up from 1.8% to 1.9%.

GN Opens New Diesel Shop at Spokane

A two-day civic celebration at Spokane, Wash., marked the opening of the GN's new diesel locomotive shop there.

The new facility known as Hillyard diesel shop was reconstructed from the shell of a former steam locomotive shop as part of a $675,000 modernization program. In place of steam locomotive pits are four service tracks, plus three tracks leading to a 16-ft pit containing a 100-ton drop table for locomotive truck replacement. A total of 40,000 sq ft of floor area have been renovated; new lunchroom, locker room and shower and toilet facilities provided; and an office set up for the assistant shop superintendent. Illumination is largely fluorescent.

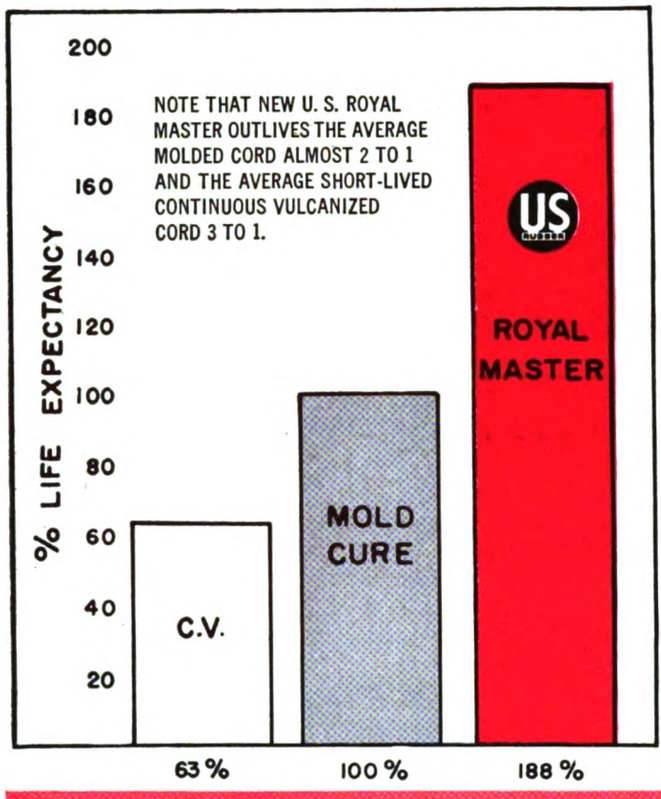
SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No		Month of October 1954	Month of October 1953	10 months ended with October 1954	10 months ended with October 1953
Freight Service (Data from I.C.C. M-211 and M-240)					
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	6,335	12,185	62,517	124,165
3-06	Total, Diesel-electric	34,547	33,184	323,832	312,552
3-07	Total, electric	674	732	6,183	7,304
3-04	Total, locomotive-miles	41,806	46,186	394,283	444,701
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,667	1,776	15,090	16,758
4-06	Empty, total	904	964	8,792	9,177
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	13,513	23,086	125,854	225,675
6-02	Total in oil-burning steam locomotive trains	2,716	6,123	22,969	60,226
6-03	Total in Diesel-electric locomotive trains	97,383	93,504	895,810	875,186
6-04	Total in electric locomotive trains	2,076	2,113	19,920	20,769
6-06	Total in all trains	116,510	125,116	1,069,462	1,184,107
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.03	1.02	1.03
10-02	Loaded freight car-miles	42.80	41.60	41.00	40.80
10-03	Empty freight car-miles	23.20	22.60	23.90	22.40
10-04	Total freight car-miles (excluding caboose)	66.00	64.20	64.90	63.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,988	2,932	2,905	2,887
10-06	Net ton-miles	1,352	1,342	1,288	1,315
12	Net ton-miles per loaded car-mile (M-211)	31.60	32.20	31.40	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.80	64.80	63.20	64.60
14	Averages per train hour (M-211):				
14-01	Train miles	18.40	18.00	18.70	18.10
14-02	Gross ton-miles (excluding locomotive and tender)	54,375	52,095	53,814	51,765
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	45.50	47.50	42.60	45.90
14-02	All	42.50	45.20	40.10	43.70
15	Average net ton-miles per freight car-day (M-240)	872	945	797	908
17	Per cent of home cars of total freight cars on the line (M-240)	49.70	41.80	53.20	46.1
Passenger Service (Data from I.C.C. M-213)					
3	Road motive-power miles (000):				
3-05	Steam	1,848	3,150	22,844	42,420
3-06	Diesel-electric	20,969	20,715	208,895	201,820
3-07	Electric	1,347	1,475	13,856	15,278
3-04	Total	24,165	25,371	245,597	259,520
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	241,462	254,532	2,465,241	2,620,631
4-09	Total in coal-burning steam locomotive trains	8,821	16,095	112,101	236,003
4-10	Total in oil-burning steam locomotive trains	7,282	11,996	85,894	147,420
4-11	Total in Diesel-electric locomotive trains	210,490	209,989	2,113,932	2,067,638
12	Total car-miles per train-miles	9.60	9.64	9.66	9.77
Yard Service (Data from I.C.C. M-215)					
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	292	598	3,095	5,979
1-02	Steam, oil-burning	56	89	514	1,068
1-03	Diesel-electric[1]	3,425	3,598	32,814	34,504
1-06	Total	3,781	4,305	36,542	41,749
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	10	17	118	201
2-02	Steam, oil-burning	6	6	51	65
2-03	Diesel-electric[1]	254	258	2,510	2,560
2-06	Total	296	313	2,968	3,118
3	Hours per yard locomotive-day:				
3-01	Steam	5.00	7.30	4.80	6.90
3-02	Diesel-electric	15.10	16.30	14.90	16.30
3-05	Serviceable	14.70	15.20	14.40	15.00
3-06	All locomotives (serviceable, unserviceable and stored)	12.70	13.60	12.30	13.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.59	1.69	1.69	1.72
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.76	.76	.75	.74

[1]Excludes B and trailing A units.

Now...88% longer

U.S. ROYAL



Chart—summarizing individual service factors weighted by their contribution to overall service life—shows new U. S. Royal Master Cord gives 88% longer life than the average of competitive molded cords.

LOOK FOR THE NAME—

U.S. ROYAL MASTER

Superior on every count!*

- 33.3% greater heat resistance
- 55.7% greater impact strength
- 53.8% greater abrasion resistance
- 30.6% greater resistance to cutting
- 110.3% greater resistance to tearing
- 21.2% greater tension or breaking strength
- 23.3% greater oil resistance
- 128.8% greater flexibility

*to the average of molded cords of other makes

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

cord life—with NEW MASTER portable cord!

Far outlasts *any* other cord made!

Service to cost ratings show new U. S. Royal Master Cord actually gives $1.88 in value for every cord dollar when compared to the average competitive molded cord!

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, new U. S. Royal Master is a finer, more durable cord — actually gives 88% longer life than the average of other molded cords — far longer than *any* other cord — surpassing even a *hypothetical* cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Write address below for FREE descriptive booklet illustrating the superiority of the U. S. Royal Master Cord. And get in touch with your "U. S." distributor today!

Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

PERSONAL MENTION

E. A. Kuhn

E. C. Ellis

C. D. Allen

Chesapeake & Ohio

Headquarters, Richmond, Va.

E. A. KUHN, superintendent motive power and equipment at Grand Rapids, Mich., appointed general superintendent motive power and machinery, with general supervision over all locomotive and car matters for system. Former position abolished. *Born*: East Radford, Va., May 2, 1897. *Education*: University of Pittsburg (1920). *Career:* Began on Toronto, Hamilton & Buffalo in 1913. Became special engineer and engineer motive power, New York, Chicago & St. Louis in 1920; assistant engineer motive power in 1929. From 1932-47 member of Advisory Mechanical Committee, C&O. In latter year appointed master mechanic, Pere Marquette, St. Thomas, Ont., and Saginaw, Mich.; in 1947, superintendent motive power, and in 1949 superintendent motive power and equipment of the C&O at Grand Rapids.

E. C. ELLIS, superintendent car department, Southern Region, appointed general superintendent car department, with system-wide supervision over all car matters. *Born*: Huntington, W.Va., October 4, 1892. *Education*: Night high school; Virginia Mechanics Institute (night); Alexander Hamilton Institute. *Career*: Became pipefitter helper on the C&O on November 2, 1909. Subsequently served as carman apprentice, coach carpenter; lead truck and platform carpenter; gang foreman; draftsman, motive-power department; general passenger car inspector; supervisor passenger car maintenance and inspection, becoming superintendent car department at Richmond on June 16, 1944.

C. D. ALLEN, superintendent motive power, Southern Region, has had jurisdiction extended to include entire system.

E. R. HAUER, assistant superintendent motive power—engineering, appointed general mechanical engineer. Former position abolished.

P. J. FINCH, assistant to superintendent motive power — diesels, engineering and maintenance, appointed assistant superintendent motive power — diesels. Former position abolished.

Jurisdictions of A. H. GLASS, chief power and fuel supervisor; J. R. BROOKS, supervisor lubrication and supplies; R. J. DEWSBURY, general air-brake inspector; D. F. DUNSMORE, electrical engineer, and J. B. ROMAN, shop engineer, extended to cover entire system.

Headquarters, Huntington, W.Va.

E. E. SLACK, supervisor work simplification, appointed assistant superintendent motive power-work simplification and personnel. Former position abolished.

Chicago, Milwaukee, St. Paul & Pacific

Headquarters, Milwaukee

C. E. BARRETT, assistant superintendent car department, appointed superintendent car department.

J. HANSEN, car shop superintendent, appointed assistant superintendent car department.

J. J. DRINKA, district general car foreman, appointed car shop superintendent.

W. C. MAUER, general car foreman, Davies yard, appointed district general car foreman.

D. D. FISHER, assistant district general car foreman in Chicago, appointed general car foreman, Davies yard.

Headquarters, Savanna, Ill.

G. L. WOOD, general car foreman at Minneapolis, appointed assistant district general car foreman.

Headquarters, Minneapolis

J. E. PALMER, assistant foreman at Milwaukee coach yard and car foreman at LaCrosse, Wis., appointed general car foreman.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (total)	Cars set off between division terminals account hot boxes			Miles per hot box car set off between division terminals
		System	Foreign	Total	
February, 1952	2,809,162,671	2,723	6,473	9,196	305,477
January, 1953	2,828,906,282	2,219	4,123	6,342	446,059
February, 1953	2,625,563,462	2,111	4,059	6,170	425,537
March, 1953	2,904,227,804	2,696	6,077	8,769	331,192
April, 1953	2,850,752,648	3,383	6,435	9,818	290,359
May, 1953	3,013,610,843	5,892	11,433	17,325	173,945
June, 1953	2,926,001,360	8,537	15,296	23,833	122,771
July, 1953	2,925,317,024	9,342	15,775	25,117	116,467
August, 1953	2,971,020,484	8,638	14,160	22,798	130,319
September, 1953	2,822,222,832	6,083	10,195	16,278	173,376
October, 1953	3,042,558,922	3,863	6,493	10,356	293,796
November, 1953	2,788,773,285	1,987	3,404	5,391	517,301
December, 1953	2,656,063,018	1,581	2,550	4,131	642,958
January, 1954	2,583,485,918	3,082	3,797	6,879	375,561
February, 1954	2,445,214,845	2,953	4,066	7,019	348,370
March, 1954	2,658,757,249	2,196	3,637	5,833	455,813
April, 1954	2,570,518,990	3,079	5,149	8,228	312,411
May, 1954	2,713,511,223	4,416	6,510	10,926	248,353
June, 1954	2,662,375,708	6,597	9,617	16,214	164,202
July, 1954	2,678,234,554	7,956	10,912	18,868	141,946
August, 1954	2,696,135,660	7,568	9,742	17,310	155,756
September, 1954	2,614,432,913	6,740	8,882	15,622	167,355
October, 1954	2,852,825,785	5,182	6,985	12,167	234,472

R. E. Baker

Maine Central

The Maine Central has terminated arrangements between the Maine Central and the Boston & Maine which have been in effect since 1933 for the employment of joint operating and mechanical department officers and personnel. As a result, the following change became effective February 1 on the Maine Central:

ROY E. BAKER, assistant general manager-mechanical at Boston, has been appointed general manager-mechanical, Maine Central, with jurisdiction over mechanical forces, including Waterville shops, enginehouse, and car and locomotive repairs.

Born: Meyersdale, Pa., February 20, 1901. *Education*: Pennsylvania State College (B.S. and E.E. 1923). *Career*: Began as an apprentice engineer, Union Switch & Signal Co., in July 1923. Entered service of B&M in 1925 as air-brake instructor and supervisor of automatic train control. Subsequently became general air-brake inspector; supervisor of air brakes, air conditioning and power plants, and assistant superintendent, Fitchburg division. Appointed superintendent of car maintenance of the B&M, Maine Central and Portland Terminal in 1945, and assistant general manager of same roads in 1948.

New York Central System

Headquarters, New York

J. H. RUSSELL appointed engineer brake equipment, with jurisdiction over system engineering and maintenance of brake and steam-heat equipment.

L. D. HAYS appointed assistant engineer brake equipment.

A. J. SERIENO appointed assistant engineer brake equipment.

Norfolk & Western

Roanoke, Va.

H. L. SCOTT, JR., H. M. SINK, L. M. NEWTON, and E. Y. MCGANN appointed mechanical inspectors in the motive-power department.

Southern

BAXTER B. SOWERS, general foreman at Asheville, N.C., appointed general foreman diesels at Sevier shop, Knoxville, Tenn.

PAUL T. HOSKINS, JR., general foreman at Appalachia, Va., appointed general foreman at Chattanooga, Tenn.

DANIEL CASS appointed road foreman of engines at Danville, Ky.

WILLIAM T. ELEAZER appointed assistant foreman electricians at Atlanta, Ga.

MILTON S. RUBLE appointed foreman enginehouse, night, at Danville, Va.

Hayne Shop, Spartanburg, S.C.

JAMES F. HOLBROOK appointed foreman car repairs.

BENJAMIN B. JONES, JR., appointed assistant foreman freight-car repairs.

JAMES C. POPE appointed assistant foreman car shop.

Southern Pacific

FRANK E. MOLLOY, assistant superintendent of motive power in Sacramento, Cal., appointed superintendent of motive power and equipment.

WILLIAM O. BROWN, master mechanic, Portland division, appointed assistant superintendent of motive power at Sacramento, Cal.

Texas & New Orleans Lines

FRANK E. RUSSELL, superintendent of motive power of the SP, has been appointed superintendent of motive power and equipment for the T&NO Lines, with headquarters in Houston, Tex.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JANUARY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Baltimore & Ohio	29[1]	900	Yard switching.	Electro-Motive
	28[1]	1,750	Road switching. (four motors)	Electro-Motive
	2[1]	1,750	Road switching. (six motors)	Electro-Motive
	4[1]	2,400	Road passenger.	Electro-Motive
	11[1]	1,000	Yard switching.	American Locomotive
	9[1]	1,600	Road switching. (four motors)	Baldwin-Lima-Hamilton
	3[1]	1,600	Road switching. (four motors)	Fairbanks, Morse
Virginian	18[2]	1,600	Road switching.	Fairbanks, Morse
Illinois Central	70[3]	1,750	Road switching.	Electro-Motive
Southern Pacific	101	1,750	Freight	Electro-Motive
	4	1,750	Passenger	Electro-Motive
	9	2,400	Passenger	Electro-Motive
	2	900	Switching	Electro-Motive
	1	660	Freight	General Electric
	8	900	Freight	Electro-Motive
	19	900	Switching	American Locomotive
	17	1,000	Switching	American Locomotive
	4	1,600	Freight	American Locomotive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Great Northern	10[4]	"Airslide" covered hoppers.	General American
Oliver Iron Mining Div., U. S. Steel Corp.	30	100-ton dump	Baldwin-Lima-Hamilton

FREIGHT-CAR INQUIRIES

Southern	1,000	50-ton box
Delaware, Lackawanna & Western	50[5]	Flat

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Railway Express Agency	300[6]	Refrigerator	General American

[1] Delivery to begin in April and be completed in June.
[2] Approximate cost, $2,900,000. Scheduled for early 1955 delivery.
[3] For delivery this year. Cost, $11,707,780.
[4] Approximate cost, $121,000. Cars delivered.
[5] For piggyback service.
[6] Estimated unit cost, $20,440.

NOTES:

Denver & Rio Grande Western.—The Rio Grande 1955 budget calls for among other items the acquisition of 18 additional diesel locomotive units and 100 double-deck stock cars. The locomotives, when delivered, will result in "virtually complete" dieselization of the 2,100-mi carrier, although plans call for a few steam locomotives to be maintained on a standby basis for peak traffic periods. In addition to the new stock cars, the road will acquire 10 more "DF" box cars for special lading and 10 cabooses. The stock cars will be built at the company's Burnham (Denver) shops. Approximately $3.3 million has been set aside for the new locomotives; "nearly" $1 million for the cars, and an additional $100,000 for improvements to existing equipment.

Baltimore & Ohio.—The B&O has ordered material for construction in its DuBois, Pa., shops of 100 70-ton 53½-ft flat cars. The cars will be completed during March of this year.

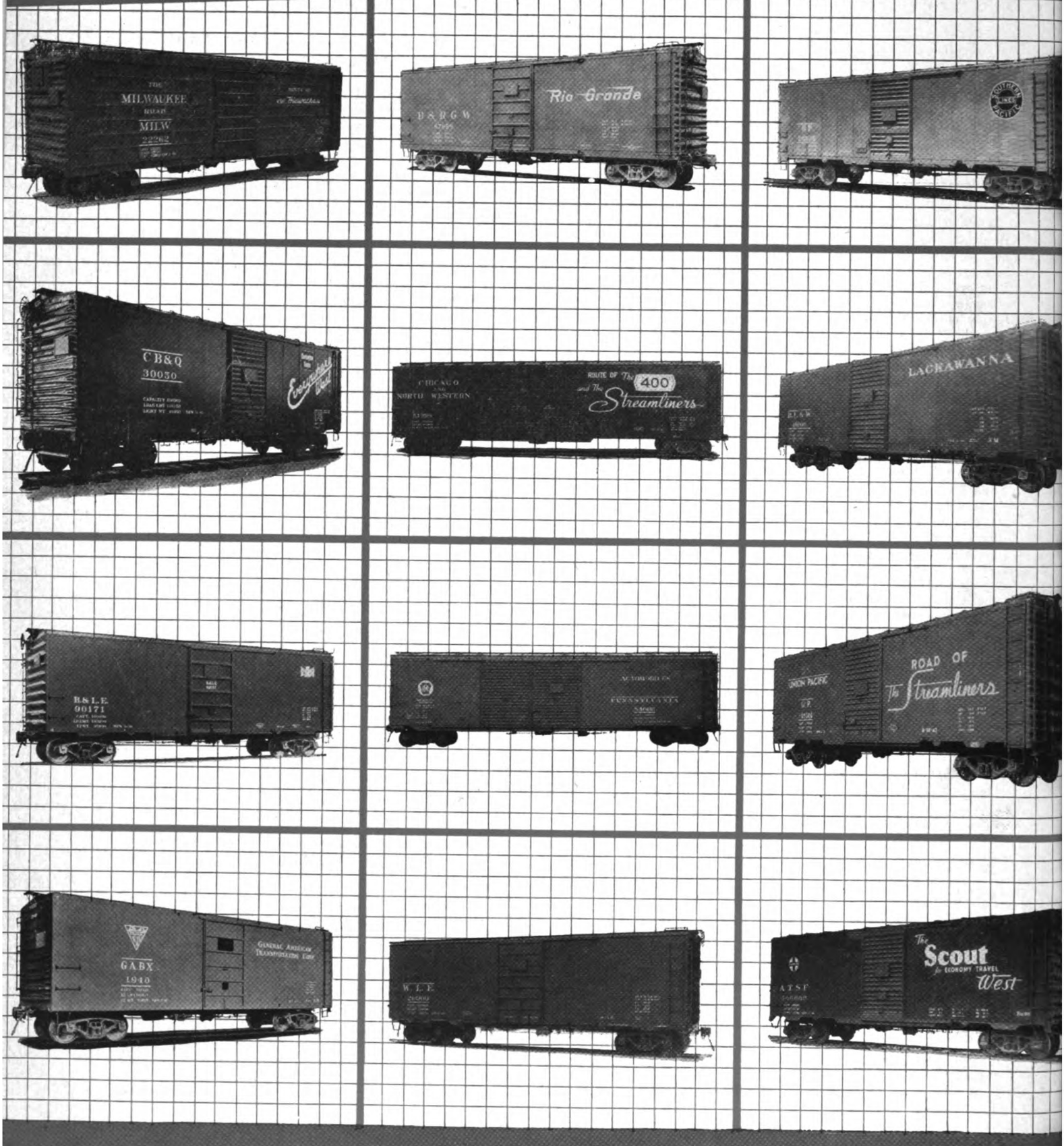
Illinois Central.—The I. C. has announced plans for 1955 capital expenditures totaling approximately $30,000,000, about $4,000,000 less than in 1954. The 1955 expenditures include almost $12,000,000 for the 70 new diesel locomotive units reported above; purchase of 100 70-ton hopper cars; equipping 100 freight cars for specialty loading; "comprehensive" repairs to 12,200 freight cars; purchase of 128 track miles of new rail; bridge replacements; and yard improvements.

New York, New Haven & Hartford.—Directors of the New Haven have authorized a rebuilding program for 1,000 box cars, built in 1941, to extend the life of the cars, in Class A service, by eight years.

The Transportation Development Corporation, New York, is reported to be working on the engineering and design of a lightweight passenger train for the New Haven, which, if accepted by the railroad, would be built by the Grumman Aircraft Engineering Corporation, Bethpage, N. Y. The TDC, formed earlier this year to promote the "Hastings" lightweight train and prestressed concrete roadbed, states that the train will be capable of speeds up to 175 mph and will carry 256 passengers in its four cars. The tentative design of the new train is said to call for use of three Packard 600-hp diesel engines. These 12-cylinder engines will drive generators which will, in turn, power direct-drive electric motors for propulsion. When supercharged, the engines are reported to be capable of developing 900 hp each. If the design is accepted, it is the opinion of John A. Hastings, vice-president of TDC, that delivery of a complete train could be made late this year.

Western Pacific.—The Western Pacific has ordered from the National Motor Bearing Company, Redwood City, Cal., material to equip 500 freight cars with the new journal bearing lubricating system developed by National Motor Bearing, as described in the January issue, page 00. The WP cars will be the first cars for interchange service to be equipped with the new lubricating device since its application on 10,000 interchange freight cars was approved by the Association of American Railroads last November 30. Installation of the WP order is to begin about February 15.

85,000 box cars have been built *better*



USS HIGH STRENGTH STEEL

EDITORIALS

Rail Burns

Increased damage to rail caused by driver burns is one of the prices the railroads are paying for the privilege of having diesel-electric locomotives. Steam locomotive drivers slip too, but they do it all at once in a way which makes the engineman acutely aware of the slipping, and since the steam locomotive drivers are relatively large, rail burns caused by slipping are less damaging than with diesels. In the case of a diesel, a single wheel may slip at a speed developed by the characteristics of a series motor and there may be slipping of all wheels of a rear unit, for example, in which case the engineman receives no cab indication, and the slipping wheels are too far away for him to hear.

A typical situation is that of a long freight train which has been braked down to less than 15 mph. The engineman must then follow the rules and not release his brakes until the train has stopped. Then, if he has more than 100 cars he must wait eight minutes after releasing the air. If he is blocking the main line, eight minutes is a long time, and he is enormously tempted to reach for the throttle before the time is up, with the thought, "Maybe she'll go now." The result is almost inevitable with probable rail burns.

The obvious answer for this particular case is closer adherence to rules, but human nature impelled by a desire to do a good job is hard to change and there are many other reasons for slipping wheels.

There are wheel-slip-preventing devices and automatic sanders for locomotives which are highly effective. They will definitely check rail burn and will definitely increase the capacity of a locomotive, because a unit so equipped will never be long "off its feet."

Of course, the answer to complete locomotive utilization would be always to have the equivalent of a dry rail. The experiments described in the October 1954 issue of *Railway Locomotives and Cars* suggest that this might be accomplished by means of detergents, and studies are under way to determine if this is practicable. One of the first criticisms of such procedure has been "We couldn't afford to keep all the rail on our lines washed." Fortunately, there are only certain sections of line bedeviled by bad rail conditions caused by light moisture and these only at certain seasons. It would appear, therefore, that this method of improving rail conditions, and the use of effective control equipment can contribute importantly to getting the work capacity out of a locomotive that was built into it. By the same means, rail burns should be reduced until they are no longer a problem.

Why Grind Wheels?

Railroads have enough maintenance work to do on cars and locomotives without performing any unnecessary operations. Why, then, do some progressive and economy-conscious roads take diesel and passenger-car wheels, especially for high-speed service, directly from wheel lathes where they have just been turned, to wheel-grinding machines for the final finishing of treads before returning them to service?

No structure can render safe and satisfactory service without a good base, and wheels are certainly the "base" of railroad rolling stock. After surrounding the manufacture of wheel and axle assemblies with the utmost precaution to assure sound materials, efficient design and reliable use, there is still the question of customer satisfaction with results produced. In the case of railway equipment, this means a smooth, comfortable ride, which cannot be expected unless wheel treads are finished accurately and concentric with the journals.

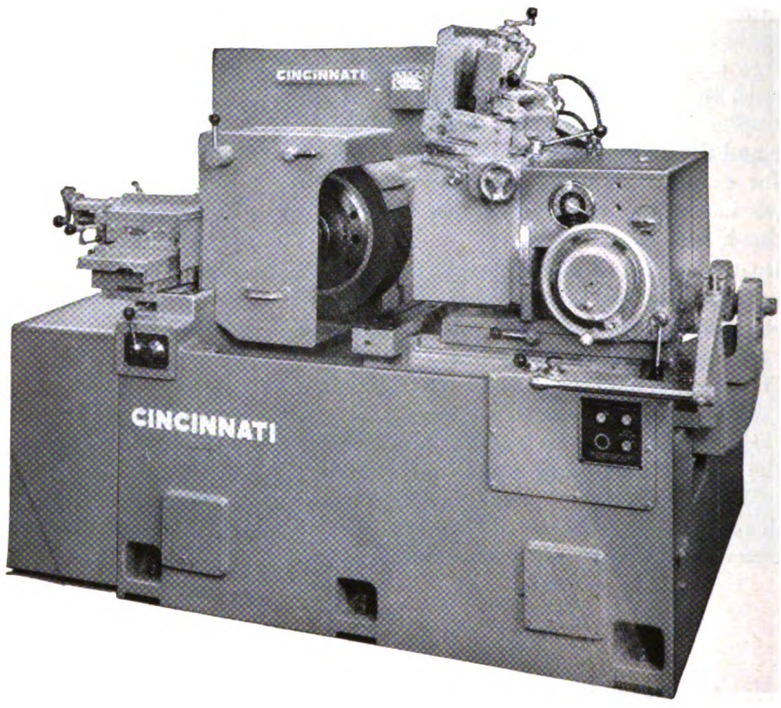
At 90 mph, a 40-in. diesel locomotive wheel makes 757 rpm and a 36-in. passenger car wheel, 840 rpm. Hammer blows from eccentric wheels weighing (with axle) two tons or more are thus delivered not only upward to the trucks and car body and downward to the track, but back and forth between truck pedestals at rates of at least 756 and 840 times a minute. Under such conditions, is it any wonder that truck-spring suspension systems are unable fully to cushion the shocks; truck parts are subject to excessive pounding, and wear and repair costs mount?

New wheels, as well as those just turned, always show some degree of tread roughness and eccentricity when placed in a wheel-grinding machine. Experience shows that the use of the grinder gives an automatic and highly desirable check on wheel-lathe condition, since only a light grinding operation is normally required, taking about 15 min for each pair of steel wheels. When wheels are received with eccentricities up to $\frac{1}{8}$ in. or more, as sometimes happens, the operator has a much longer job and immediately complains to his supervisor about the kind of work that is being turned out on the wheel lathe.

Wheel grinding machines have gone through a remarkable development process in recent years and are now being used to re-form the entire flange, tread and outer taper of steel wheels. The desirability of maintaining wheel treads concentric with journals is hardly open to question. Apparently one of the best ways to do this is with a grinder which does a quick, smooth and accurate job with eccentricity limited to 0.003 in. or even less if desired.

The Hottest News in Centerless Grinding in 30 Years

...the New Cincinnati Filmatic No. 2



FILMATIC

New CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Catalog No. G-644.

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No other machine tool manufacturer has this extensive centerless experience.

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Bed-rock grinding wheel spindle mounting
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And now these additional advantages are included . .

Infinitely variable regulating wheel speeds
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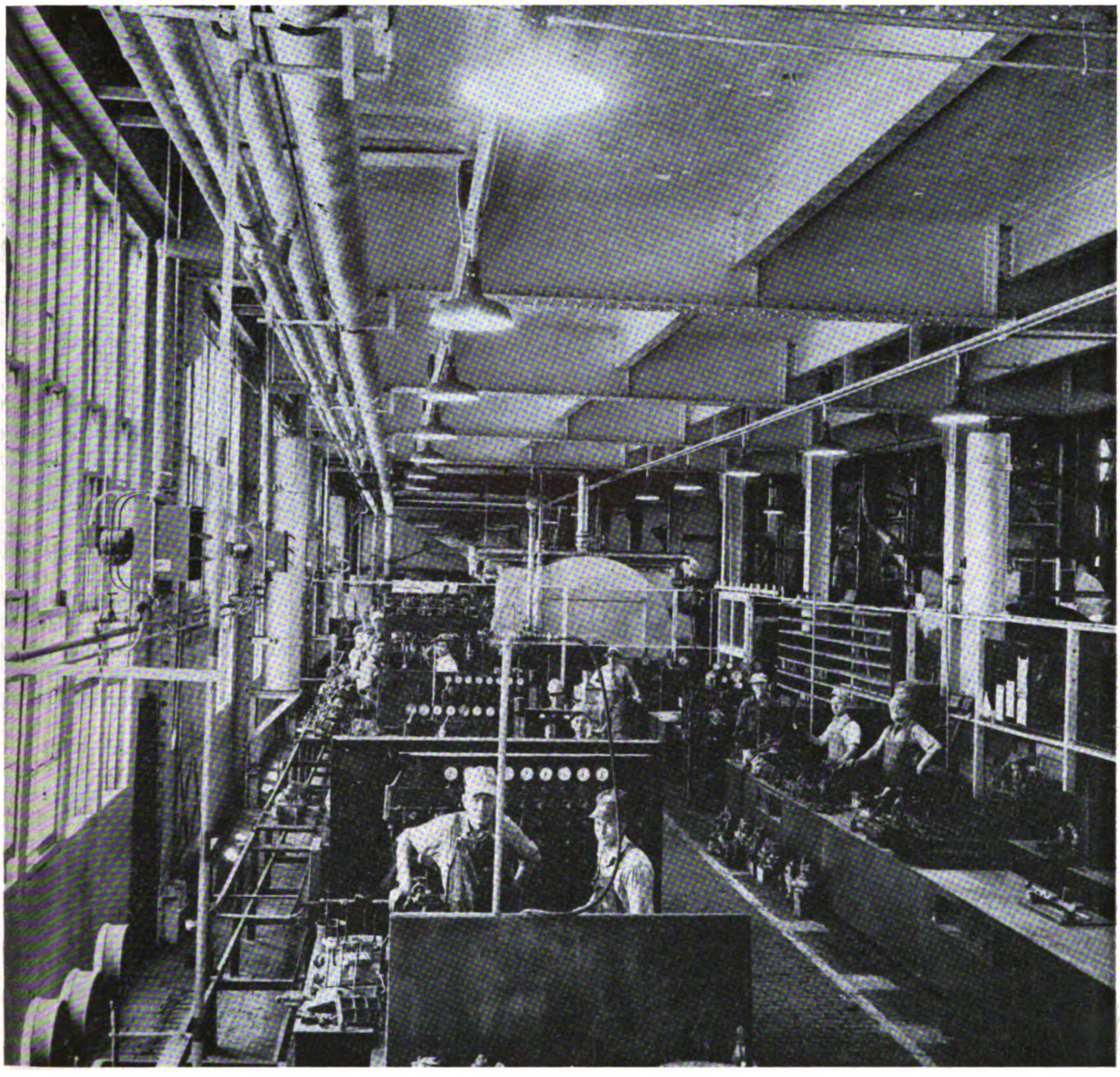
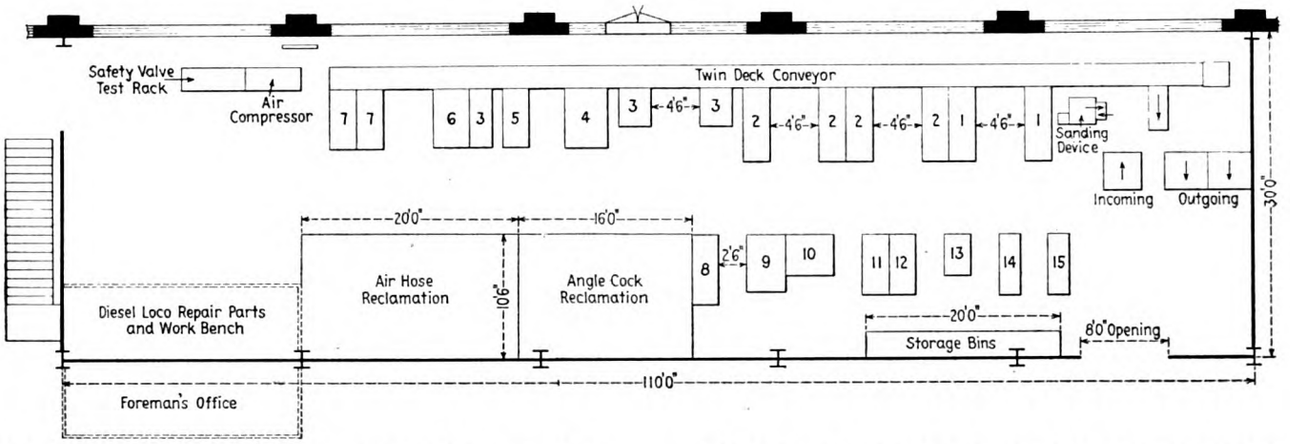


Production-Line Air Room on the KCS

New air brake facility at Pittsburg operating on the assembly line principle has several unique features

THE KANSAS CITY SOUTHERN has set off and enclosed by a wire grill an area 30 ft by 110 ft in the Pittsburg back shop to handle major repairs to all air brake equipments for the system. One side is devoted almost entirely to a mechanized assembly line for overhauling AB valves, the other to repair work on passenger and locomotive brake equipment and to hoses, couplings, angle cocks, etc.

KCS Production-Line Air Room . . .



1—Disassembly bench; 2—AB valve bench; 3—AB test rack; 4—AB test rack with electric test panel; 5—D-22 and D-24 control valve bench; 6—4C test rack; 7—Locomotive brake valve benches; 8—U-12 control valve bench; 9—3-USB test rack; 10—4-F test rack; 11—Feed valve bench; 12—Triple valve bench; 13—3T test rack; 14—Slack adjustor bench; 15—Decelostat bench

The AB side of the room is served by a two-level dolly track with the top track on a slight down incline as the valve proceeds successively to the cleaning station, the work stations and the test rack. The bottom track inclines downward as it proceeds in the return direction with the overhauled valve to the shipping point.

The valves are delivered in the room to what is the start of the upper track and the end of the lower track. An individual valve is removed from the group and placed into a sanding chamber where rust and scale are removed from the valve housing. Next it is placed on a small carriage and allowed to roll free along the inclined track to the disassembly bench. It is removed from the carriage, the service portion is cleaned, and the housing and parts are placed back on the carriage. The procedure is repeated at the next station, where the emergency portion is disassembled. A hinged bumper at each station along the line permits the carman to raise the bumper at his station to stop a rolling carriage, or with a flick of a finger, pivot the bumper down and out of the path of any oncoming carriages.

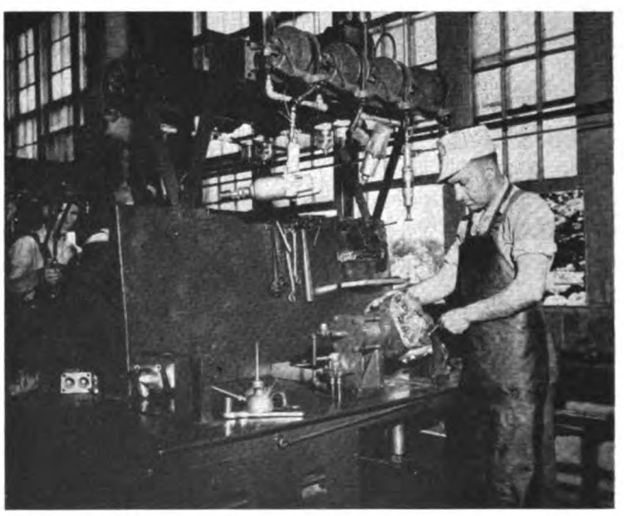
Final steps of assembly and testing complete the valve's trip along the assembly line track. As it rolls down the final length of track the loaded carriage overbalances a weight supporting this hinged section. It drops abruptly, allowing the carriage to roll onto the return track directly below and travel non-stop to an automatic elevator at the end of the track.

Although assembly line techniques have been employed in the brake valve servicing operation it is not a constantly moving line. The first six stations are divided equally between the service and emergency portions of the valve. If the first airman is occupied when the valve carriage starts to roll down the track he disregards the carriage and permits it to roll to whichever station is ready to receive it.

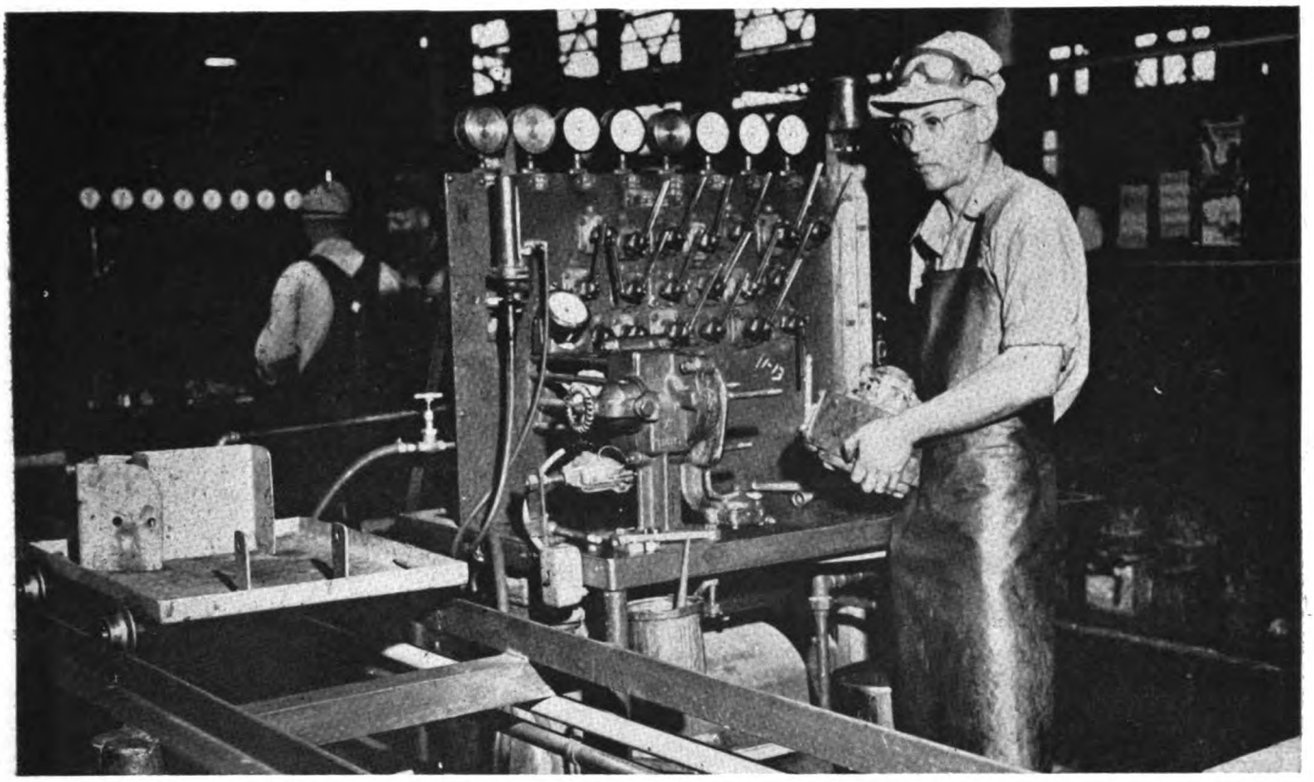
The last service stand is not part of the AB valve assembly line, but is used for servicing locomotive air brake valves. It is handled by machinists of the diesel shops. This station is placed along the assembly line because that location also happens to be closest to the diesel shop. Complete operation of servicing and testing is performed at this bench.

Two AB valve test racks complete the assembly line

The service benches are located next to the twin-deck conveyor and have deep drawers for bulky equipment



Pneumatic vise with roller bearings around jaw permit rotation of valve housing to get at any part



The carriage hauls the valve between assembly line stations and serves as a tray for dissembled parts.

side of the room. The other half of the room is used for servicing passenger equipment valves and other miscellaneous types and for other test equipment. Angle cocks are repaired and tested and blank air hoses are fitted with nipples and couplings.

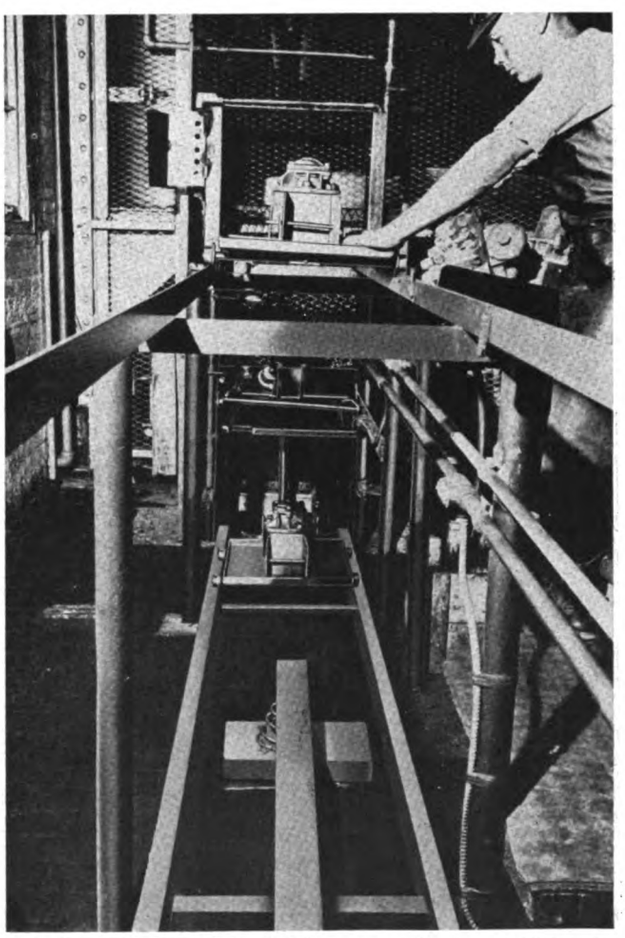
Automatic Stops and Elevator

When the overhauled valve approaches the end of the lower track on its non-stop return trip, a spring-controlled brake slows the momentum sufficiently to permit the carriage to roll onto an air operated elevator at the end of the track. As it passes onto the elevator platform the carriage trips a solenoid which causes the elevator to ascend to the assembly line level near the spot from which it started. The valve is removed from the carriage and placed in readiness with other renovated valves.

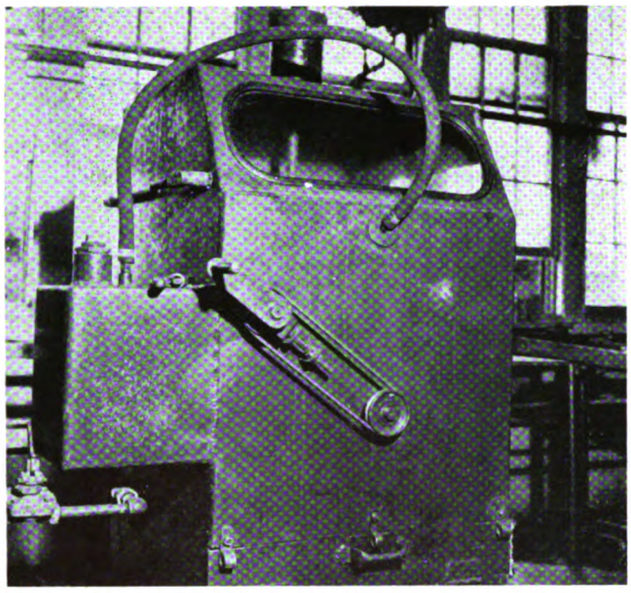
Solenoids at the return end of the assembly line operate holding devices to prevent collision of carriages or any fouling of the elevator mechanism. A solenoid-activated device also releases the air to permit the elevator to descend to its normal position after the renovated valve and its carriage are removed from the elevator.

The elevator is controlled by one magnetic valve and two switches. As a loaded carriage rolls onto the elevator it trips a solenoid, which activates the magnetic valve controlling air pressure in the lift cylinder. Air pressure forces the elevator upward to the top level where, in rolling off, another solenoid is tripped, the magnetic valve is de-energized, thus shutting off the air. The weight of the elevator platform is sufficient to expel the air and permit the elevator to descend.

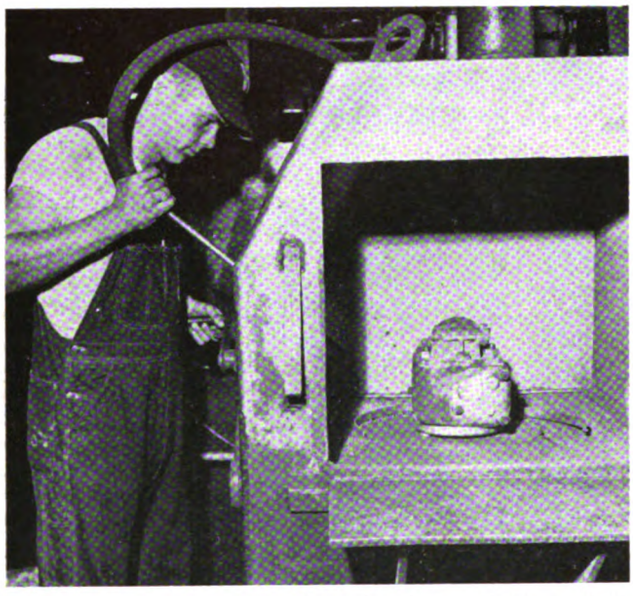
While the elevator is in its lifting and descending cycle, a holding device prevents an oncoming carriage from running off the end of the track into the elevator shaft.



Beginning and end of twin-deck conveyor, with a completed valve waiting to board elevator, shown midway in ascent



The air brake valve housings get a thorough cleaning in this completely enclosed blasting chamber



With the door open, operator shows how he uses table crank to revolve housing and clean all surfaces with nozzle

The revolving table, and the wire mesh through which the spent shot falls for removal, cleaning and re-use

Attached to the elevator platform is a small, flat metal finger projecting horizontally in the direction of the oncoming carriages. This finger, when the elevator is not in use, depresses a spring-loaded safety post, located on the floor directly beneath the finger. When the elevator rises, the finger rises with it, thus releasing the tension of the safety post and permitting it to rise likewise. In its extended position, the post prevents any oncoming carriage from running off the track.

If more than one carriage is permitted on the return track at once, they will pile up at the safety post and have to be pushed manually onto the platform. There are no other retarders or holding devices on the return track. Assembly line progress is so arranged that no more than two valves ever occupy the return rails at the same time.

The valve carriage is a homemade device which serves the twofold purpose of conveying the valve from station to station and of providing a tray for the valve parts. On the rectangular bed have been welded metal forms into which the valve housing fits snugly. The carriage bed is connected to the wheels at only two points—in the middle at the front and rear. This type of suspension gives the carriage lateral stability and lessens the probability of a derailment along the track.

Enclosed Chamber For Cleaning

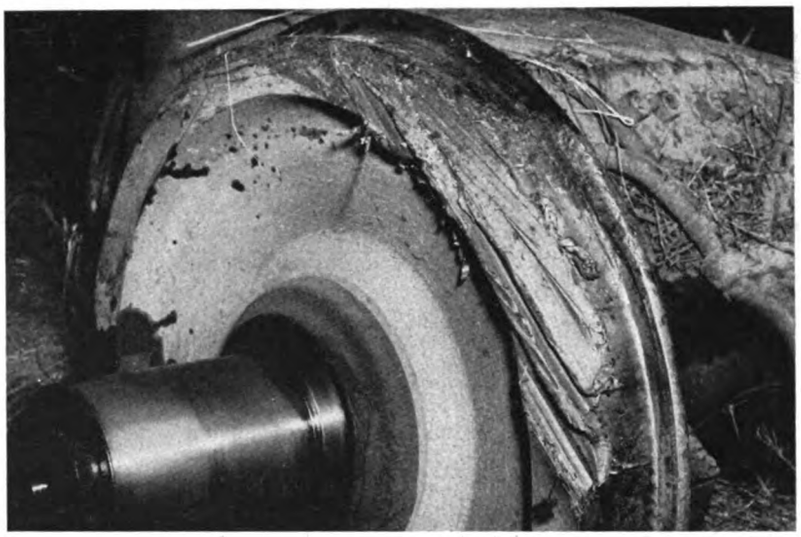
Sand blasting is done in a completely enclosed chamber. The operator sets the worn valve on a small circular table in the sander and seals the door. An incandescent bulb inside the chamber illuminates the work, which the operator can observe through plexiglass panels located on two sides of the chamber. The nozzle of the sand blasting hose protrudes through a sleeve from the outside where the operator directs the blast against the valve housing. A hand crank located conveniently enables the operator to rotate the housing as the work continues.

Sand, used originally as the propulsive ingredient, has been replaced by spherical shot, about size 10 or 11. This type, in turn, may be replaced by angular shot. Spent shot falls through the wire mesh to the bottom of the chamber, where it is removed, cleaned and re-used.

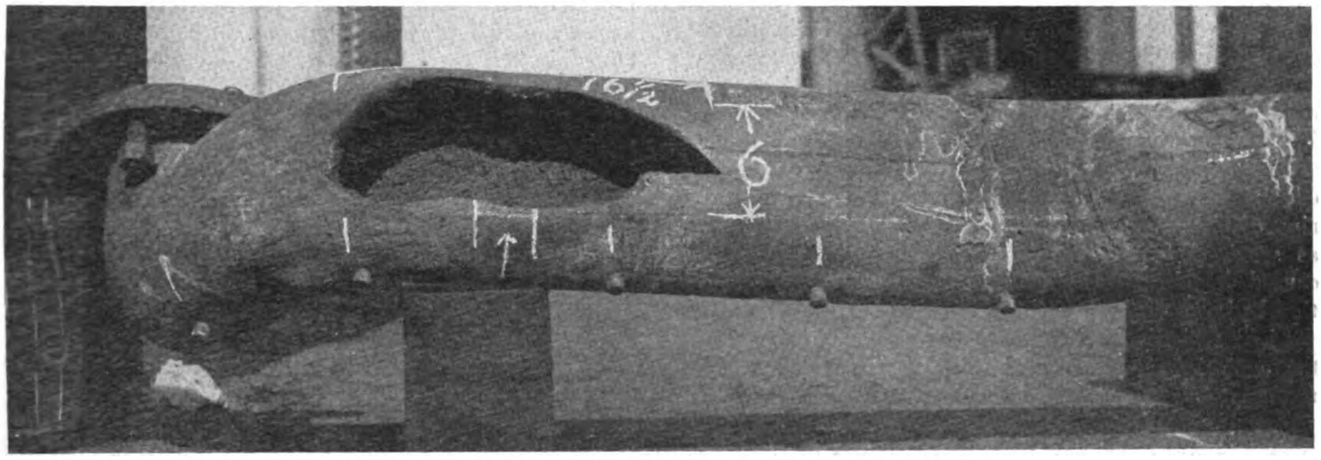
The work benches are 2 ft 6 in. by 6 ft 10 in., constructed entirely of scrap metal and embody many features to facilitate the air brake repairman's work, including elevated steel decking. Chief point of activity is the valve housing vise. When the carman lifts the valve from the carriage he sets it on a small pneumatic stand. Steadying the housing with one hand he twists a double acting valve which raises the valve housing into correct position between the jaws of the air operated vise. A twist of the lever in the opposite direction tightens the vise jaws against the valve housing and at the same time releases air pressure on the stand, thus allowing it to reseat itself in position on the table.

Vise jaws revolve on roller bearings and permit the operator access to all necessary bolts and nuts on the valve housing with his air operated impact wrenches strung overhead. There are one large and one small impact wrench, one miscellaneous head for grinding, burnishing and buffing, and one compressed air hose. All of these are attached to tension controlled reels which snap up and out of the way when not in use. The vise eliminates practically all manual lifting of the housing while it is being serviced.

IN 1954 . . .



A SEIZED traction motor pinion bearing caused the sliding damage on the above driving wheel. The opposite wheel (left) shows the 8-in. flat slid spot on the tread and the false flange which displaced a switch rail causing derailment and injuries to 189 persons.



MAIN STEAM PIPE which failed on a locomotive hauling a freight at 35 m.p.h. The core had apparently shifted during casting as subsequent investigation showed considerable variation in wall thickness.

Bureau Reports on Locomotive Defects

THE ANNUAL REPORT of the ICC Bureau of Locomotive Inspection for the year ended June 30, 1954, shows an "improvement" in the situation with respect to steam locomotives (due almost entirely to the rapidly diminishing numbers—ED.) and a rapidly increasing number of defects with respect to "locomotives other than steam." Every indicator of condition in this category shows that the percentage of those inspected and found defective is not only increasing but the number ordered out of service and the number of defects found is increasing also. The tables accompanying this abstract tell the situation at a glance.

Thirty-two accidents occurred in connection with steam locomotives resulting in 1 death and 39 injuries. This represents a decrease of 27 accidents; a decrease of 11 in the number of persons killed, and a decrease of 23 in the number of persons injured compared with the preceding year.

During the year 13 per cent of the steam locomotives inspected by the inspectors were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this is an increase of 0.6 per cent from the results of the preceding year.

One hundred and seventeen locomotives were ordered withheld from service by the inspectors because of the presence of defects that rendered the locomotives immediately unsafe; this is a decrease of 46 locomotives compared with the preceding year.

The single boiler explosion which occurred in the fiscal

year was caused by overheating of the crown sheet due to low water. One person was killed and 7 were injured in this accident. There was a decrease of 3 boiler explosions as compared with the preceding year; a decrease of 9 fatalities and an increase of 5 in number of injuries from this cause as compared with the preceding year.

The locomotive involved in the explosion was engaged in terminal switching service and at the time of the accident was standing in a freight car yard. Examination of the boiler subsequent to the accident disclosed that the water level at time of the explosion as shown by sheet discoloration was approximately 6½ inches below the highest part of the crown sheet. It was also determined that gage cock nipples extended into the dripper thereby obstructing clear view of gage cock discharge.

A piece of the wall of the main steam pipe in the front end of a steam locomotive, approximately 6 x 16½ inches in size, broke out while the locomotive was hauling a freight train at an estimated speed of 35 miles per hour and resulted in serious injuries to 2 employees. The failure occurred in an area where the pipe wall was very thin, a fissure existed and the metal contained old fractures.

The thin wall apparently was caused by a shifted core when the pipe was cast.

Another front-end accident occurred when the petticoat pipe in the smokebox of a steam locomotive became displaced; diverted the flow of exhaust steam and caused heavy back draft while the locomotive was hauling a freight train at an estimated speed of 35 miles per hour and caused serious injury to an employee. The bottom edge of the petticoat pipe had been attached to the top ring of the spark arrester by spot welds instead of bolts as specified by the manufacturer. Cinder cutting had caused detachment of some spot welds and heavy vibration had caused the remaining welds to fail.

Eighteen boiler and appurtenance accidents other than the explosion resulted in injuries to 19 persons. This represents an increase of 4 accidents and an increase of 2 in the number of persons injured in boiler accidents other than explosions as compared with the preceding year.

Four hundred and ninety-eight applications were filed for extension of time for removal of flues, as provided in Rule 10. Investigations disclosed that in 28 of these cases the condition of the locomotives or other circumstances were such that the requested extensions could not properly be granted.

Eleven extensions were granted after defects disclosed by the investigations were required to be repaired. Thirty-three applications were canceled for various reasons. Four hundred and twenty-six applications were granted for the full period requested.

Seventy-three accidents, resulting in 2 deaths and injuries to 263 persons occurred in connection with locomotive units propelled by power other than steam. This represents a decrease of 2 in the number of accidents, an increase of 2 in the number of persons killed and an increase of 175 in the number of persons injured compared with the preceding year.

During the year, 8.9 per cent of the locomotive units inspected by the inspectors were found with defects or errors in inspection that should have been corrected before the units were put into use; this represents an increase of 0.2 per cent compared with the results obtained in the preceding year. One hundred and forty locomotive units were ordered withheld from service by the inspectors because of the presence of defects that rendered the units immediately unsafe; this represents an increase of 22 units compared with the preceding year. Locomotive units found defective were not ordered out of service if such defects did not render them unsafe for the service to which they were put.

Accidents Involving Other Than Steam Locomotive Units

In derailment of two locomotive units and 11 cars of a passenger train caused by a false flange on a slid flat driving wheel resulting from a seized traction motor pinion bearing on a diesel-electric locomotive unit, 184 passengers, 4 mail clerks and 1 dining car employee were injured. Evidence developed during investigation of the accident indicated that the locked pair of wheels had been sliding for a distance of more than 24 miles prior to point where derailment occurred. No lubricant was found in the seized bearing which showed evidence of extreme overheating. The extent of damage to the bearing precluded determination of the cause of its failure. Because of the serious potentiality of accidents caused by sliding wheels it was recommended in a report prepared jointly with the Section of Railroad Safety that action be taken to provide that an indication of any slipping or sliding wheel on any diesel-electric unit in the locomotive of a train will be shown in the control cab.

During the year, 11 persons were injured in falls caused by oil or grease accumulations on walking surfaces of diesel-electric locomotive units. Disability in these accidents amounted to 171 man-days. Oil leaks represented a large proportion of 1,703 defects reported by inspectors of locomotives under item of "cab floors, aprons and deck plates." Action to avoid continuance of this type defect and accidents resulting therefrom is being stressed.

Incidence of cracked and broken wheels under diesel-

ACCIDENTS AND CASUALTIES CAUSED BY FAILURE OF SOME PART OR APPURTENANCE

STEAM LOCOMOTIVE, INCLUDING BOILER OR TENDER

	Year ended June 30—				
	1954	1953	1952	1951	1950
Number of accidents	32	59	122	167	169
Percent increase or decrease from previous year	45.8	51.6	26.9	1.2	25.9
Number of persons killed	1	12	3	14	7
Percent increase or decrease from previous year	91.7	[1]300.0	78.6	[1]100.0	30.0
Number of persons injured	39	62	126	170	184
Percent increase or decrease from previous year	37.1	50.8	25.9	7.6	24.3

[1] Increase.

STEAM LOCOMOTIVE BOILER

	Year ended June 30—						
	1954	1953	1952	1951	1950	1949	1915
Number of accidents	19	18	35	51	59	81	424
Number of persons killed	1	10	2	3	4	9	13
Number of persons injured	26	19	36	59	70	94	467

LOCOMOTIVE UNITS OTHER THAN STEAM

	Year ended June 30—				
	1954	1953	1952	1951	1950
Number of accidents	73	75	74	54	51
Number of persons killed	2	...	1	2	3
Number of persons injured	263	88	77	129	50

REPORTS AND INSPECTIONS

STEAM LOCOMOTIVES

	Year ended June 30—				
	1954	1953	1952	1951	1950
Number of locomotives for which reports were filed	12,135	15,798	20,490	26,595	29,743
Number inspected	19,999	28,899	45,220	62,113	66,809
Number found defective	2,599	3,583	6,234	7,995	6,740
Percentage of inspected found defective	13.0	12.4	13.8	12.9	10.1
Number ordered out of service	117	163	370	508	399
Number of defects found	9,763	12,980	24,738	34,657	28,504

LOCOMOTIVE UNITS OTHER THAN STEAM

Number of locomotive units for which reports were filed	27,135	25,374	22,716	19,320	15,719
Number inspected	83,338	75,170	65,263	52,948	42,503
Number found defective	7,395	6,571	6,087	4,375	2,748
Percentage of inspected found defective	8.9	8.7	9.3	8.3	6.5
Number ordered out of service	140	118	135	106	42
Number of defects found	19,640	17,163	16,613	11,935	6,325

electric locomotive units continues, but no accident was reported from this cause during the past year. The necessity for careful and frequent inspection of diesel unit wheels is well recognized, and apparently the railroads are exercising diligence in the matter of wheel inspections.

One person was killed when his clothing became entangled around a moving and unguarded fan shaft as he attempted to obtain a water sample from an inconveniently located water glass drain cock. Three other persons suffered amputation of a total of 9 fingers and 2 of these also had arms broken when caught in auxiliary generator drive belts that were not properly protected. Because of limited space within bodies and under hoods of diesel-electric locomotive units, complete protection of moving and rotating parts is essential if accidents are to be avoided.

Three crankcase explosions and two fires on diesel engines resulted in injuries to six persons. Electrical fires in engine compartments, about units, short circuits and explosions caused by flash-overs in electrical cabinets caused injuries to nine persons. Because of danger of fires resulting from the liquid fuel and the high pressures and temperatures used in diesel engines and the possibility of accident from electrical short circuits, a high standard of inspection and maintenance is required at all times if accidents are to be avoided.

Specification Cards and Alteration Reports

Under Rule 54 forty-five specification cards and 1,036 alteration reports were filed, checked, and analyzed. These reports are necessary in order to determine whether or not the boilers represented were so constructed or repaired as to render safe and proper service and whether the stresses were within the allowed limits. Corrective measures were taken with respect to numerous discrepancies found.

Under Rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 1,975 specifications and 811 alteration reports were filed for locomotive units, and 639 specifications and 430 alteration reports were filed for boilers mounted on locomotive units other than steam. These were checked and analyzed and corrective measures taken with respect to discrepancies found.

No formal appeal by any carrier was taken from the decisions of any inspector during the year.

CASUALTIES CLASSIFIED ACCORDING TO OCCUPATION

UNITS OTHER THAN STEAM

	Year ended June 30—									
	1954		1953		1952		1951		1950	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
Members of train crews:										
Engineers	..	24	..	14	..	15	..	11	..	15
Firemen	..	29	..	36	..	31	1	30	..	21
Brakemen	..	7	..	12	1	12	..	4	..	3
Conductors	..	2	..	5	..	4	..	..	..	4
Switchmen	..	3	..	2	..	8	..	5	..	1
Maintenance employees	2	8	..	4	..	6	1	3	..	3
Other employees	..	2	..	2	..	1	..	13	1	2
Nonemployees	..	188	..	13	..	..	..	63	2	1
Total	2	263	..	88	1	77	2	129	3	50

STEAM LOCOMOTIVES

Members of train crews:										
Engineers	1	13	4	23	1	36	2	51	2	64
Firemen	..	10	4	21	2	45	3	62	2	64
Brakemen	..	4	3	8	..	19	1	20	2	29
Conductors	..	2	..	3	..	3	..	6	..	4
Switchmen	..	..	..	2	..	2	1	8	..	5
Roundhouse and shop employees:										
Boilermakers	..	..	..	..	..	2	..	2	..	2
Machinists	..	2	..	1	..	2	1	2	..	1
Foremen	..	..	..	1	..	2	..	2	..	1
Inspectors	..	..	..	..	..	..	..	2	..	2
Watchmen	..	2	..	..	..	2	1	..	1	4
Boiler washers	..	..	..	..	..	..	..	..	..	..
Hostlers	..	..	..	..	..	8	1	4	..	1
Other roundhouse and shop employees	..	..	..	2	..	2	..	2	..	2
Other employees	..	..	..	..	..	1	..	3	..	4
Nonemployees	..	6	1	1	..	2	4	6	..	1
Total	1	39	12	62	3	126	14	170	7	184

PARTIAL LIST OF PARTS FOUND DEFECTIVE, INOPERATIVE OR MISSING

LOCOMOTIVES OTHER THAN STEAM

	Year ended June 30—		
	1954	1953	1952
Air compressors	326	210	206
Batteries	82	40	39
Boilers	175	103	69
Brake equipment	2,126	1,698	1,450
Cabs and cab windows	858	679	813
Cab floors, aprons, and deck plates	1,703	1,589	1,694
Controllers, relays, circuit breakers, magnet valves and switch groups	454	424	222
Draft gear	291	218	202
Driving boxes, shoes, and wedges	154	128	98
Fuel system	1,951	1,853	1,751
Internal-combustion engine defects, parts and appurtenances	4,848	4,564	4,768
Jumpers and cable connectors	178	156	191
Motors and generators	813	655	674
Sanders	1,200	1,224	1,202
Steps, footboards, et cetera	622	505	480
Trucks	503	439	390
Warning signal appliances	121	122	117
Wheels	257	212	230
Number of defects	19,640	17,163	16,613

STEAM LOCOMOTIVES

	1954	1953	1952
Air compressors	304	351	671
Brake equipment	835	1,038	1,955
Cabs, cab windows, and curtains	298	354	694
Cylinders, saddles, and steam chests	364	455	908
Driving boxes, shoes, wedges, pedestals, and braces	258	345	681
Frames, tall pieces, and braces, locomotive	151	225	368
Gage cocks	120	211	337
Injectors and connections	674	843	1,615
Packing nuts	240	294	552
Packing, piston rod and valve stem	154	220	494
Reversing gear	170	216	429
Rods, main and side, crankpins, and collars	315	459	990
Sanders	277	324	552
Springs, and spring rigging	834	1,322	2,424
Steps	255	321	561
Tanks and tank valves	340	466	980
Throttle and throttle rigging	228	327	608
Trucks, engine and trailing	171	263	427
Trucks, tender	152	219	474
Valve motion	174	195	437
Water glasses, fittings, and shields	282	357	651
Wheels	107	151	340
Number of defects	9,763	12,980	24,738

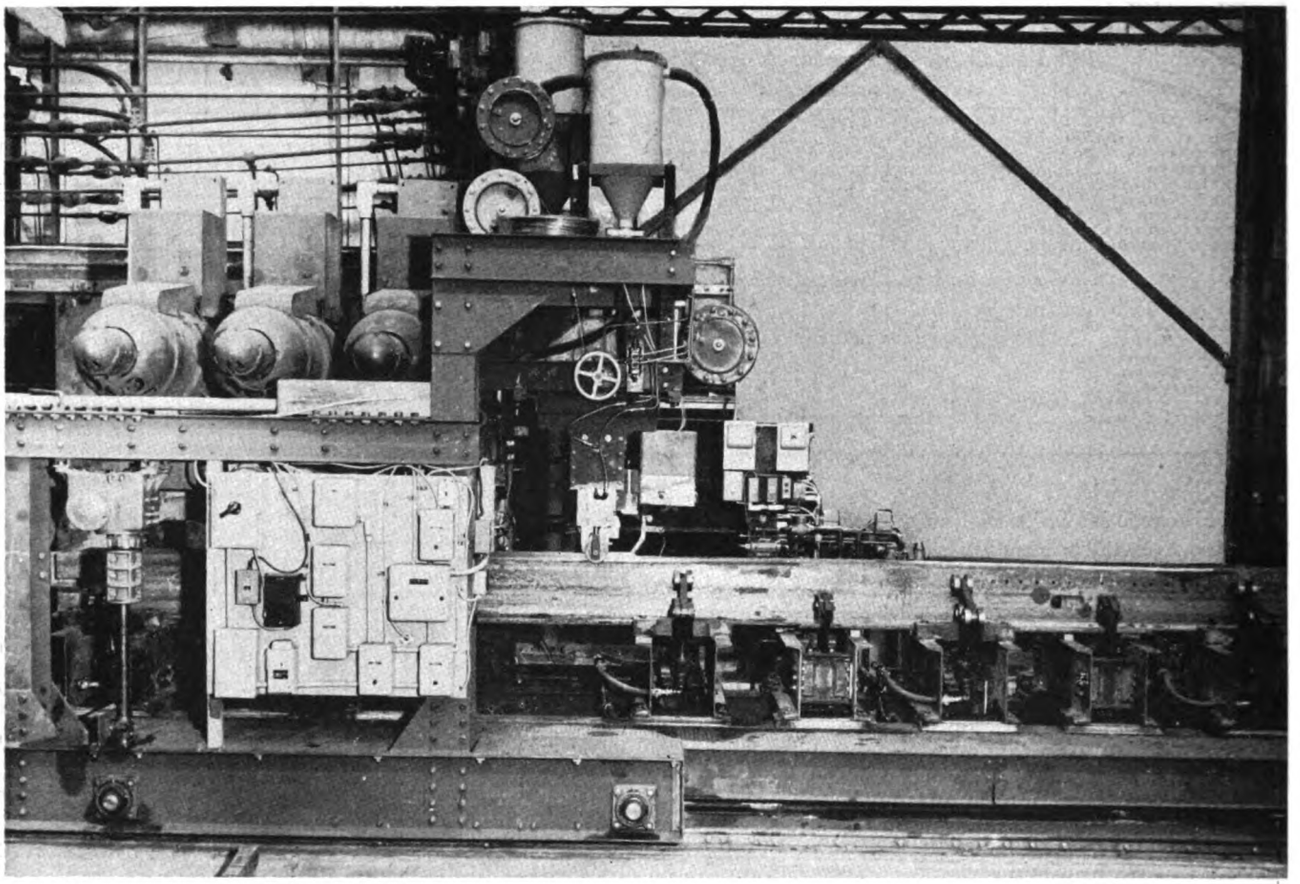


FIG. 1—General view of the welding machine.

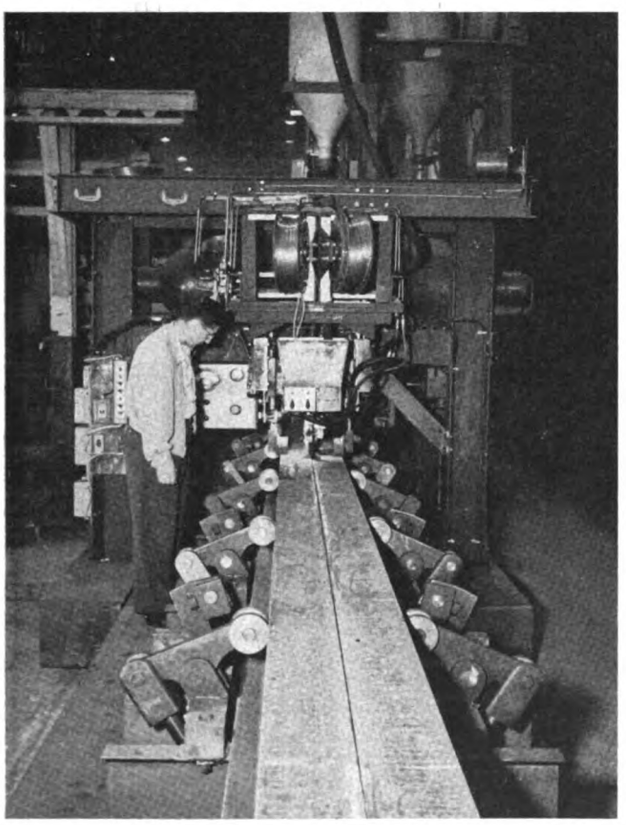


FIG. 2—The two Z bars which make the sill are held in position by hydraulic clamps during the welding operation.

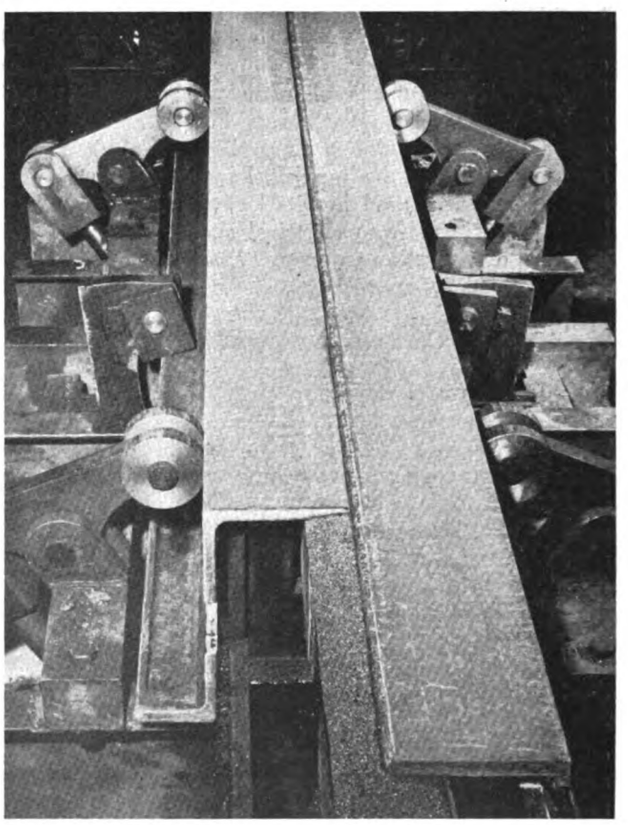


FIG. 3—Welding flux is pressed against the bottom of the weld as shown.

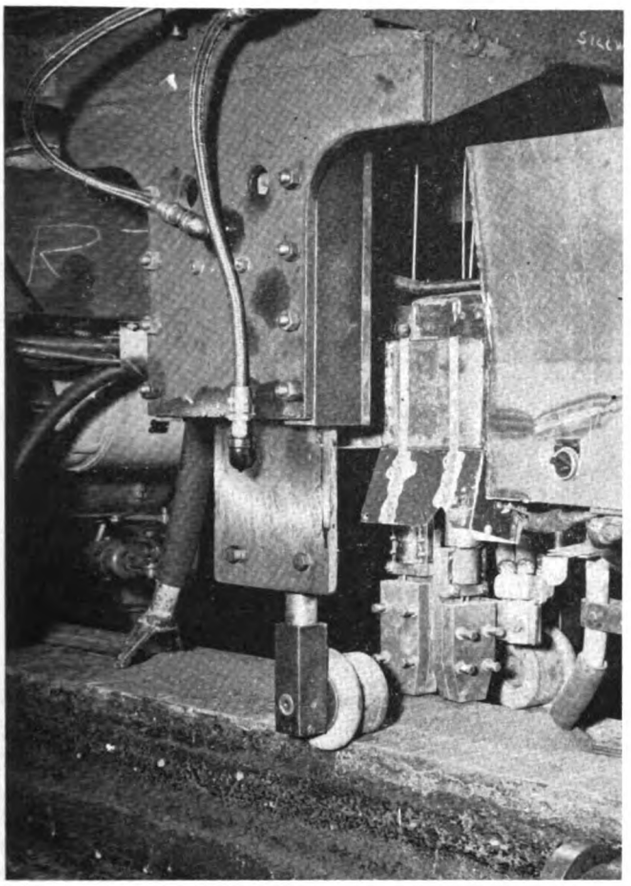


FIG. 4—Flux is laid down on top of the bars ahead of the weld and picked up behind.

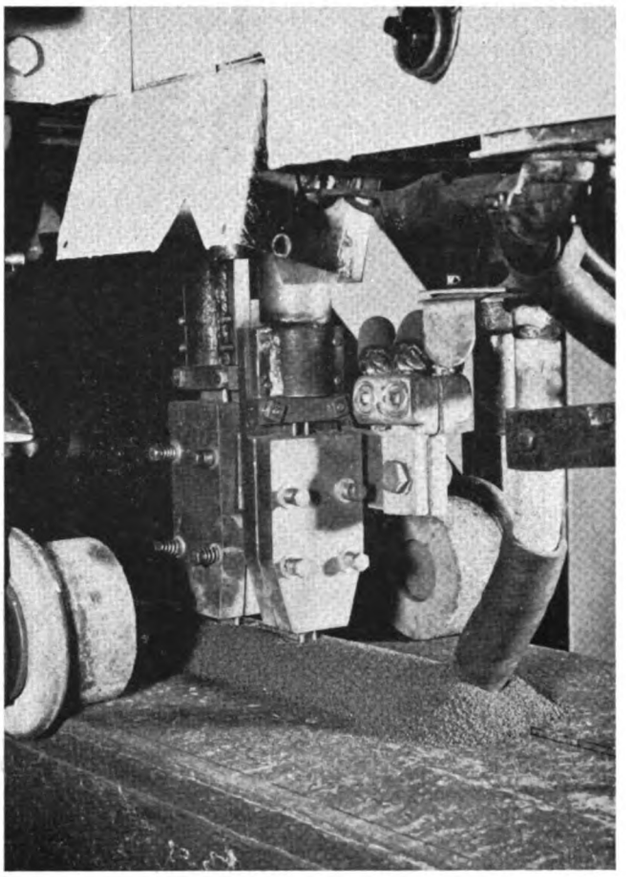


FIG. 5—The two forward electrodes make the initial weld and the third which trails, increases the penetration.

Welded Center Sills for Freight Cars

A. C. F. Industries develops a highly improved automatic welding process which insures a high quality product

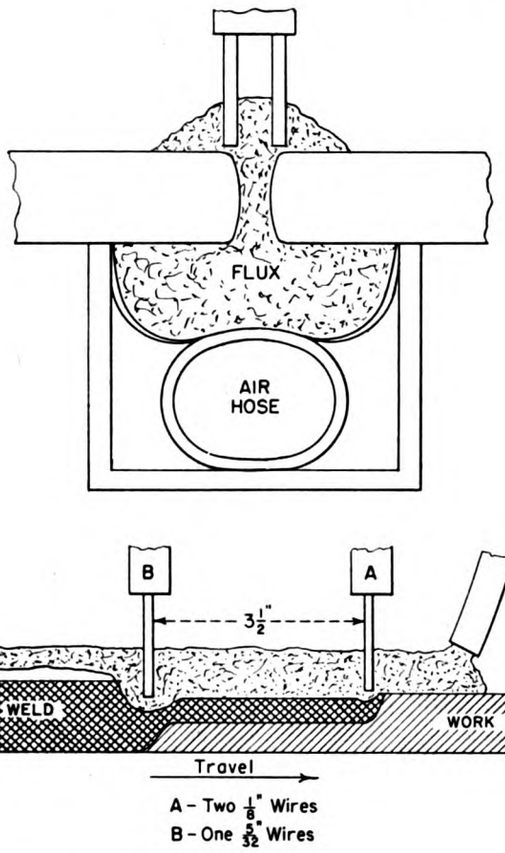
CENTER SILLS for freight cars manufactured by A. C. F. Industries are now being fabricated by a new automatic welding process. The sills are made of two Zee bars placed back to back and welded along the edges of the two upper flanges.

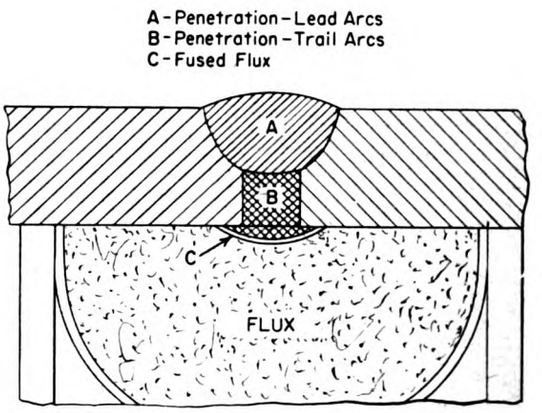
Submerged arc welding is employed, and during the welding process the under side of the weld is backed up with welding flux. The flux is contained in a canvas retainer as shown in the sketch and is held tightly against the weld by a 3-in. hose inflated with air. The hose is placed under the canvas retainer as shown.

The two Zee bars are placed as shown in Fig. 2 and Fig. 3, and are held in place on a jig by a series of hydraulic clamps which maintain an inside measurement of 127/8 in. A camber of 1½ in. in 40 ft is built into the jig so that the sill is held at this camber during the welding operation. The jig will take all weights and sizes of Zee bars up to 60 ft in length. The welding is accomplished by means of a traveling gantry which straddles the Zee bars. The gantry carries three d-c welding sets, a flux recovery unit, three reels of welding wire and two automatic welding heads and secondary power requirements.

As the carriage moves along the weld, flux is deposited ahead of the weld as shown in Fig. 4, and is picked up by a vacuum cleaner behind the weld as shown in the same illustration.

Three welding wires are used as shown in Fig. 5. The first two which make the initial weld are ⅛-in. in diameter and the third is 5/32 in. The first two make a weld having a penetration as shown by *A* in Fig. 8. The third wire which trails the first two by 3½ in. increases the penetration as shown by *B* in Fig. 8, over the greater part of the weld. For a distance of two feet on either side of the bolster center, the current on the third wire is increased so that the penetration is increased as shown by *C* in Fig. 8. Current value used on the first electrodes which are in parallel is 1,350 amp and for maximum





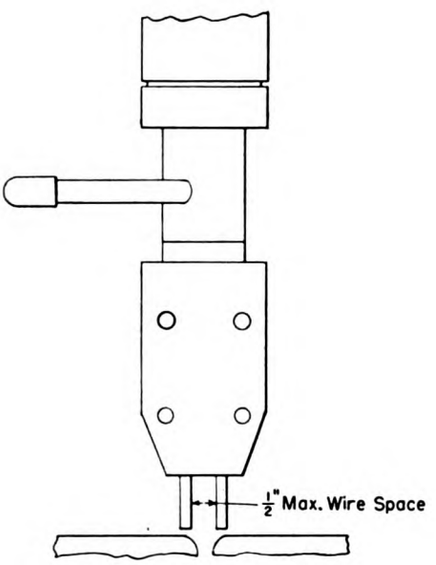
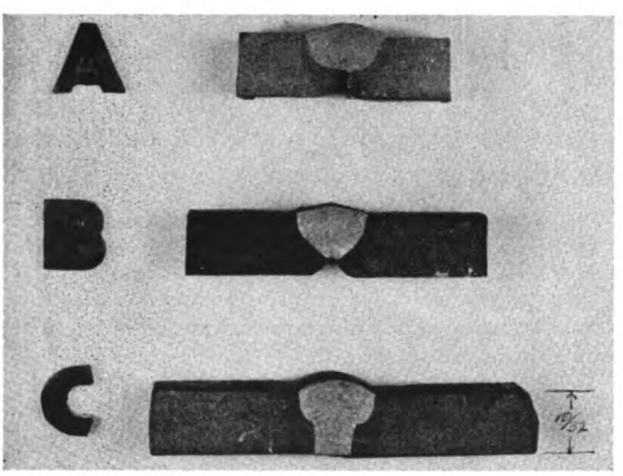


FIG. 7 (above)—Relation of electrodes and flux during the welding operation. Fig. 8 (below)—Penetration of weld: A—leading electrodes only with 1,350 amp; B—leading electrodes (1,350 amp) and trailing electrode with 600 amp; C—leading electrodes (1,350 amp) and trailing electrode with 900 amp.



penetration, it is as high as 900 amp on the third wire. Speed of welding is 5 to 6 ft per min.

In Fig. 5, the two leading electrodes are shown side by side. These may be rotated to any desired position and this is done by the operator as the work progresses depending upon the spaces between the two Zee bar flanges. No mechanical preparation of the edges to be welded is required.

The control panel shown in Fig. 6 is mounted on the carriage beside the welding head and constantly shows

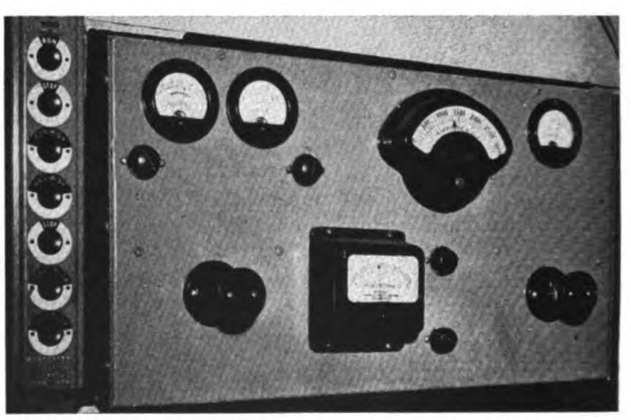


FIG. 6—The control panel mounted on the welding carriage.

current values to the operator and permits him to adjust them as the work progresses. The electrodes are electrically positive to the work.

Average welding speeds are 50 to 80 in. per min. At this rate, the machine deposits about 88 lb of weld metal per hour.

CABOOSE No. 903 was equipped with electric lights and radio.

Cabooses With Lights and Radio

Lackawanna has built 61 new units of own design in own shops—the last word in comfort and efficiency

DURING the past 20 months the Lackawanna has been turning out, at its Keyser Valley, Pa., car shops, a group of 61 new all-steel cabooses. Thirty-two of these have been equipped with electric lights and 27 with two-way radio. These new cabooses are an all-Lackawanna product—both design and production. These new caboose cars are numbered 850 to 910.

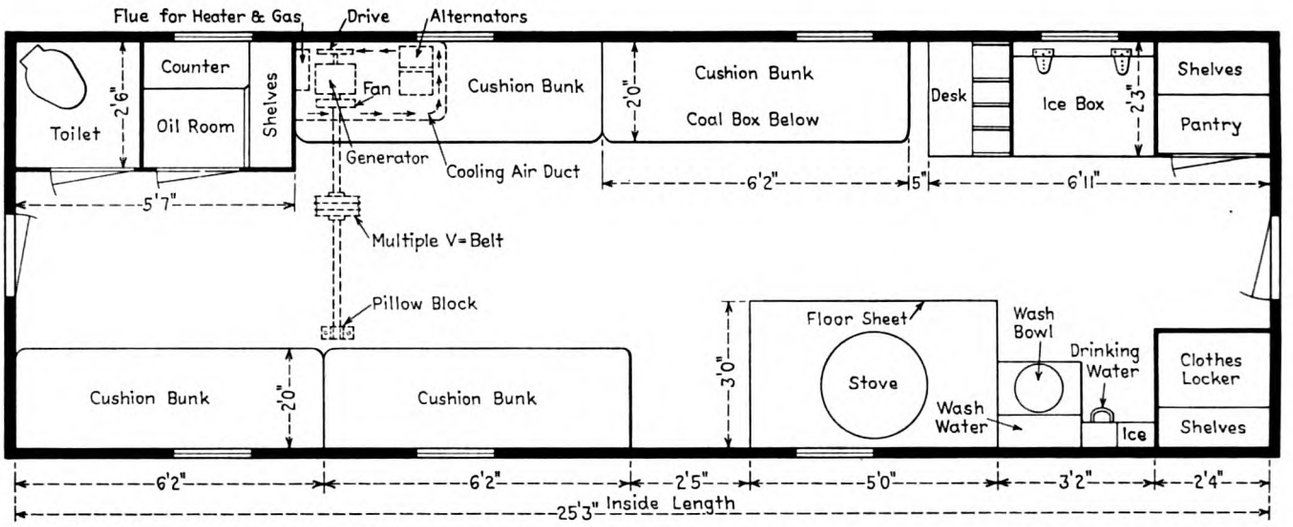
The car bodies are ¼ in. steel, all welded which results in simplification of manufacture and a better appearing job when completed.

The first caboose, No. 850, was erected and placed in service in 1948 to get the reaction of train crews that were to use them when the program got under way. The men were asked to comment on the car's riding qualities as well as its other features in order that the cabooses would be satisfactory and comfortable. As a result of this test period, a number of alterations was made in the original plans that could not have been foreseen.

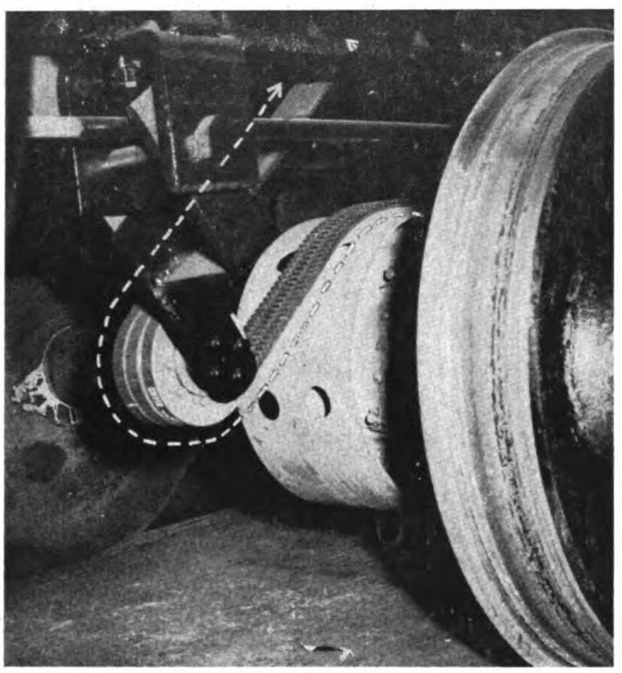
In this connection, shop employes and supervisors submitted suggestions to facilitate the production of the cars and provide additional safety features. These included

FEATURES OF THE NEW CARS:

- All-steel construction
- Welded, insulated bodies
- Axle-driven generators
- Cast-steel underframes
- Improved riding qualities
- Aluminum sash—safety glass



INTERIOR PLAN of the new DL&W cabooses.



EQUIPMENT with which new cabooses are fitted to operate alternator-generator. Dotted line follows axle-driven belt up into body.

the rounding of square corners, repositioning of grab irons and other handrails. A coping over the windows was added to help keep out the rain.

In determining the type of caboose best suited for the Lackawanna's heavy grades and pusher service, it was decided to use as underframes the cast steel tender beds from retired steam power. This not only provided the necessary additional strength, but was an important economic consideration.

The underframe was fitted with a standard draft gear pocket on the forward end by welding and the height was adjusted to the caboose by a heavier body center plate and extended side bearings. A steel plate was installed as a floor.

The car body itself is almost entirely welded in subassemblies, such as sides, ends, roof and cupola, and these parts are then assembled on the underframe as a single unit by welding. The sides, floor, ends and roof are insulated to keep out cold and heat, thus preventing abnormally high temperatures in the summer and providing a consistent temperature in the winter with a minimum of coal. The insulation also reduces track and wheel noise.

Over the insulation fir plywood was applied to the walls, ends and ceiling to provide a smooth interior. Pine was used for flooring. All lockers and cupboards are of welded steel construction.

The cars are equipped with aluminum sash, glazed with safety glass set in rubber and the side cupola sash slides forward and backward for the convenience of employes while watching their train.

The trucks are equipped with long elliptical springs and steel wheels for easier riding. The center plate is fitted with a fiber filler, 3/8 of an inch thick, to keep truck noise out of the car.

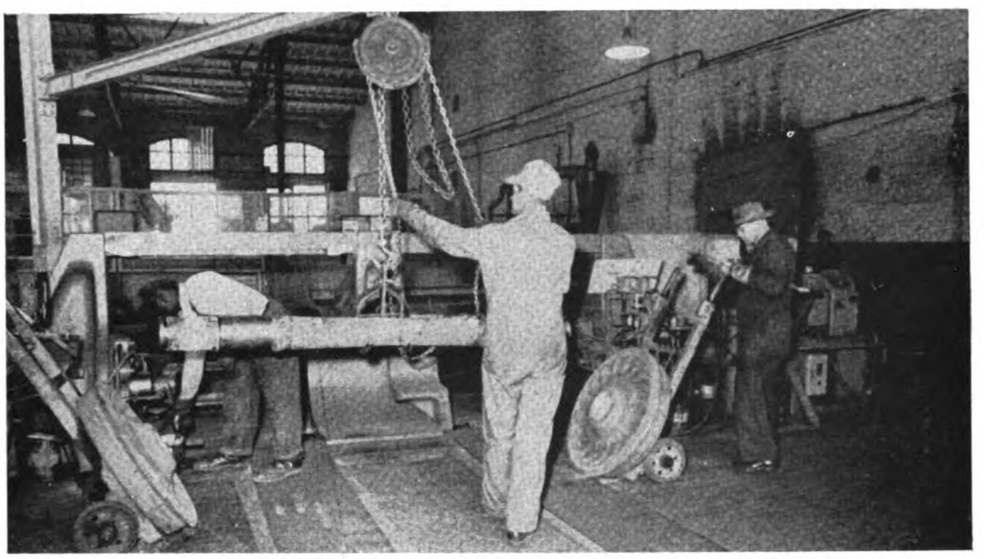
Cars Have "Zippers"

Each car is equipped with a device called a "zipper," which closes a valve in front of the angle cock and allows the pusher locomotive to cut off without stopping the train. The air brakes also may be released from inside the caboose by stepping on a floor release valve.

As the radio installation program for freight trains got under way 32 of the cabooses were scheduled to be equipped with alternator-generators to provide power for the radios. However, only 27 will have radios installed. As a by-product of this, electric lights are being installed in the 32 cabooses. A dome light is located in each end of the body of the car and another over the conductor's desk. The marker lights also are electric, with a part of the bottom cut away so that light shines on the steps. The lights inside have individual switches, and in addition another switch is located in the cupola so the ceiling lights can be turned off to reduce glare at night.

The alternator-generator is driven by a belt arrangement, operating off the axle and is so arranged that it will produce electricity regardless of the direction in which the caboose is operating. This obviates the necessity to turn the caboose at the end of a run. Storage batteries of sufficient capacity to carry the car from Scranton to Buffalo without failure of the system are used.

Ideas for the Car Repair Man...



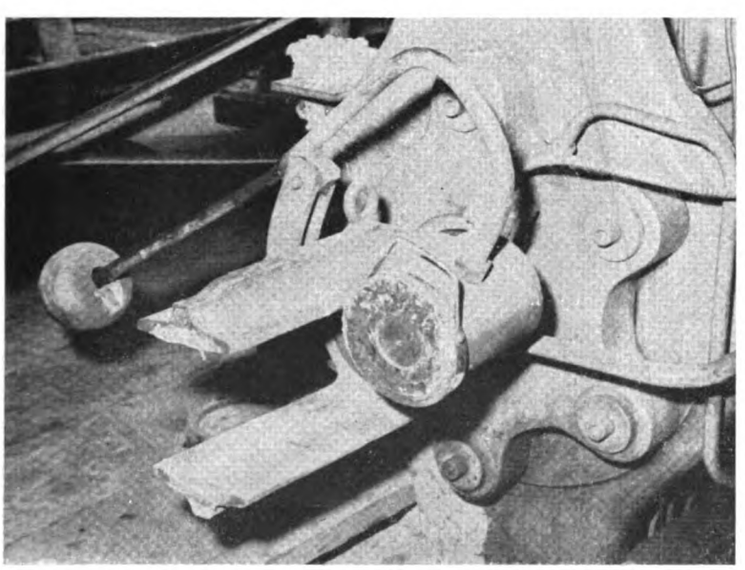
Axles are delivered by jib crane and hoist, and wheels by chisel trucks.

WHEEL PRESS DATES AXLES.—Means of applying car wheels to axles as developed in the Bayshore shops of the Southern Pacific, in San Francisco, Calif., serve to bring out the potentials of the wheel press. The axle is picked up from a supply of axles at one end of the press by a chain hoist on a jib crane, and is swung into a position in front of the press. Wheels are brought to positions at either end of the axle on chisel trucks.

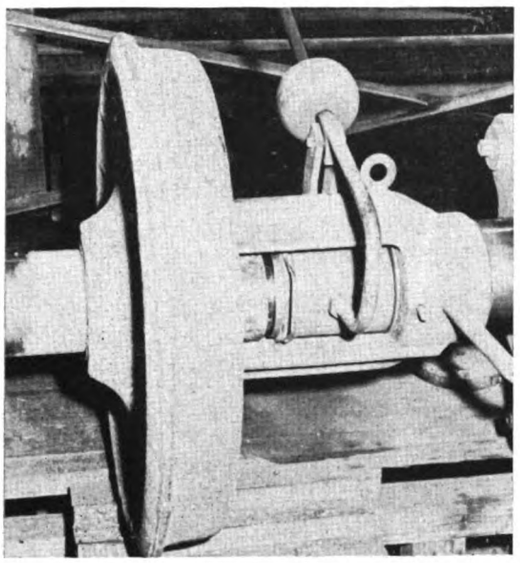
Journals are protected with hinged guards, and wheel seats and axle bits painted with wheel mounting compound. With the wheels in the position, the axle is lowered until its ends rest in the wheel fit. Then the chisel trucks are tipped up to a vertical position until the chisel edges rest on the floor. Then by pushing the one at the right forward, the wheels are slid onto the axle to a loose fit. This is made possible by a plate in the floor which slides laterally on roller bearings.

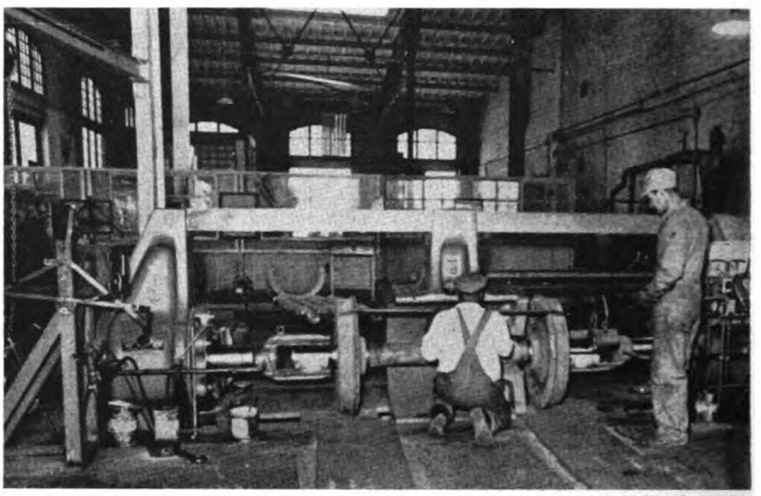
With the wheels on the axle, the loose assembly is rolled into position on the press. One wheel is pressed on at a time. This is accomplished by placing a space block against the axle at one end, while the wheel at the other end is pressed on by the press fork.

When the right-hand wheel is to be pressed on, a space block is held against the left end of the axle. When this is done, the swinging space block on the right end is swung out, and up.



A swinging space block has a counterweight which will hold it in either position.—A space block at one end permits pressing on a wheel with the press fork at the other.





The swinging block (left) carries a date stamp and the axle is stamped when the opposite wheel is applied. The wheels are pressed to gage (above) when the second wheel is applied.

When the left-end wheel is to be applied, the space block on that end is removed to allow the press forks to contact the wheel and the tilting block on the right end is swung down between the press forks.

The tilting block has two features. By means of the sliding weight, it can be made to remain in either position. Also inserted in the block are steel date stamps which are set into holes in the block, permitting a change of date for each day. The proper stamp for all axles is thus assured.

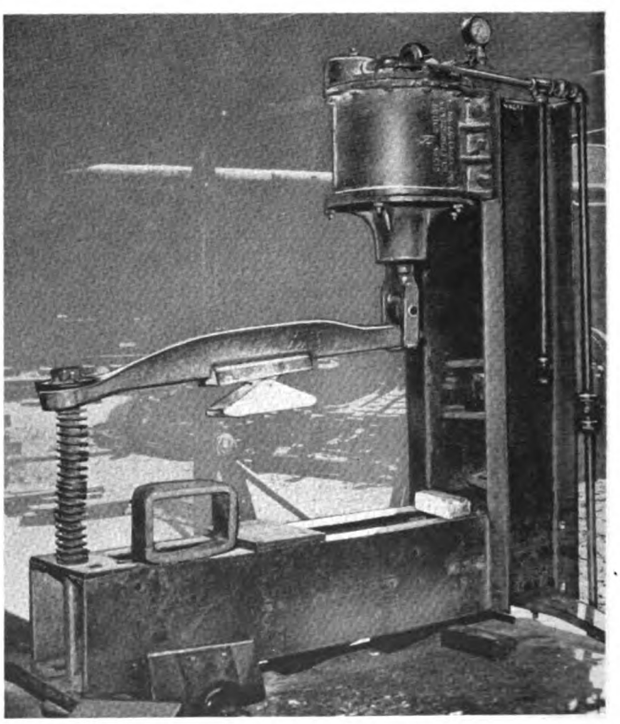
The wheels are pressed to gage and the pressure required is recorded. Mounted wheels are rolled out of the shop on the tracks shown in the foreground.

The press has a capacity of 600 tons, and is now used for car wheels. It will also be used for diesel locomotive wheels.

ELLIPTIC-SPRING COMPRESSOR.—Passenger-car elliptic springs can be compressed by a 16-in. air cylinder. The cylinder is mounted on a structure which has a base of two lengths of steel with a cross-section 1½ in. by 5 in. on which rests two 13-in. channels. The cylinder, itself, is attached to two additional 13-in. channels, mounted vertically, which bolt to the base channels. The base channels are set 13 in. apart and are 6 ft. long; the vertical channels to which the air cylinder is secured are 5 ft. 9 in. high.

A car side bearing is pinned to the under side of the lever arm to take care of small irregularities in the positioning of the spring. The bolt that supports the free end of the lever arm is 2¼ in. in diameter and 39 in. high. A coil spring is wound around this bolt to hold the lever bar up to allow the elliptic spring to be placed on the press for being squeezed. The head of the bolt is attached to one of the 1½-in. by 5-in. steel pieces which form the sub base.

The springs are held in the compressed state by the clamp shown resting on the base. This is shaped with a bevel the same as the spring and fits on in one direction only.



Press for compressing passenger-car elliptic springs.

FIG. 1—General appearance of locomotive.

New Haven Gets Rectifier Locomotives

By F. D. Gowans

Ten locomotives to be added to 100 m-u cars already in service may be forerunner of things to come in railroad motive power

■ In December 1954, delivery was begun on an order of 10 rectifier type locomotives for the New Haven. These are high-speed passenger locomotives, operating over the railroad's electrified line between New York City and New Haven, Conn.

Although quite similar in characteristics and performance to other type locomotives now being used in this service, the new motive power differs from them in many electrical and mechanical features. To appreciate these, it is necessary to understand the unusual nature of the New Haven passenger locomotive operation into New York City. The railroads's main line is electrified with an 11,000-volt, 25-cycle, single-phase, overhead a-c system from New Haven, Conn., to Pennsylvania Station in New York. From Woodlawn, going into Grand Central Terminal over the Park Avenue Viaduct, the line is electrified with a 660-volt, d-c third rail system. Passenger locomotives must, therefore be designed for operation from these two power sources; must carry complete train heating equipment and supplies, yet must not exceed the axle loading limit of 58,000 lb. over the viaduct.

Abstract of a paper presented by F. D. Gowans, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa., before the Midwinter General Meeting of the American Institute of Electrical Engineers, held in New York, January 31-February 4, 1955.

Application

Until recently the use of rectifiers in railway applications, has been limited largely to substations furnishing direct-current power for use on locomotives and cars. The first large domestic application of rectifiers as part of the locomotive or car propulsion equipment began in 1954, when the New Haven received delivery of 100 m-u cars, equipped by the Westinghouse Electric Corporation.

In recent years, the d-c traction motor has benefited from intensive development for the diesel-electric locomotive. Facilities for quantity production, and experience

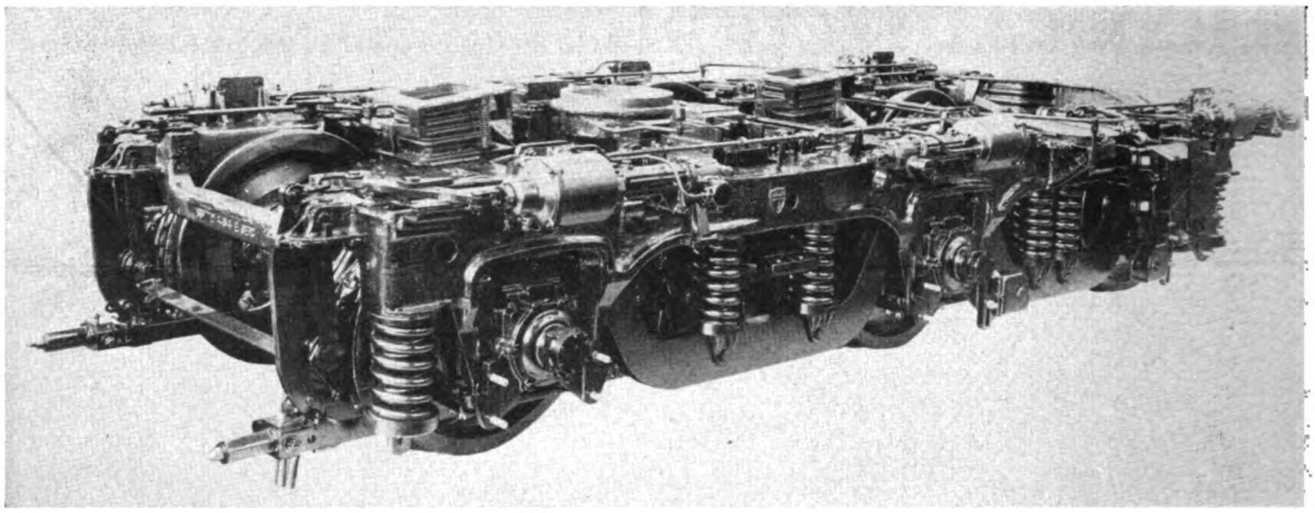


FIG. 2—Three-quarter view of truck with motors assembled.

gained from thousands of motors in service have greatly reduced the manufacturing cost and maintenance expense of traction motors. The rectifier locomotives here described benefit from this development through the use of General Electric's standard GE-752 d-c motor.

General Description

The cab, of box-type construction with streamlined ends, is fabricated from sheets and structural shapes by welding. The cab sides are designed as load-carrying girders which support the underframe and equipment. Each end of the underframe is fitted with a pilot, rubber draft gear and tight-lock coupler. New Haven standard headlights, marker lights and number lights are built into the nose sheets.

TABLE I—LOCOMOTIVE DATA

Weight	
Total locomotive fully loaded	348,000 lb
Per driving axle	58,000 lb
Dimensions	
Track gage	56½ in.
Length inside knuckles	68 ft
Height over cab roof	12 ft 8⅜ in.
Height d-c trolley locked down	14 ft 9 in.
Height a-c trolley locked down	14 ft 8¼ in.
Width over cab sheets	9 ft 11⅛ in.
Width overall	10 ft 5⅝ in.
Total wheel base	52 ft 6 in.
Rigid wheel base	15 ft
Length between center plates	44 ft
Wheel diameter	40 in.
Coupler height	34 in.
Clearance motor gear case to rail	4½ in.
Minimum curve	288 ft, 20 deg
Supplies	
Train heating water	1,800 gal
Train heating fuel	400 gal
Sand	20 cu. ft.
Ratings	
Tractive force at 25 per cent adhesion	87,000 lb
Tractive force continuous	34,000 lb
Speed at continuous rating	44 mph
Power at continuous rating	4,000 hp
Maximum speed	90 mph
Train heat boiler steam cap	500 lb per hr

A combined fuel and water tank for train heating supplies is hung below the cab underframe between the trucks.

Arrangement of equipment on the roof provides for an a-c pantograph mounted on a hatch cover at each end. These hatch covers are built as ducts. Ventilating air for the equipment is taken in from the side of these ducts at the roof level. The center portion of the roof is solid and carries the accelerating resistors and blowers.

Both ends of the cab are streamlined, with front windows above the curved hood, and windows at the same level on the side to give maximum visibility.

Side doors at both ends provide entrance to the operating cabs. Access to the roof is by means of an inside ladder and roof opening.

The cab is carried on two, three-axle, swing bolster trucks (see Fig. 2). All axles are motored. To provide room for the motor on the center axle, the centering plate is located between axles one and two. Spring loaded, sliding plates on each side of the truck frame between axles two and three also carry load and provide uniform distribution of weight on the axles.

Inside equalizers, supported on top of the roller bearing journal boxes, carry the cast steel truck frame on helical springs. The frame in turn carries the swing bolster and center plate on four swing links, spring plant and elliptical springs.

Foundation brake gear is designed for 75 per cent braking. Clasp brakes are employed with one cylinder for each wheel. Each cylinder is fitted with an automatic slack adjuster.

Location of Apparatus

Principal pieces of apparatus are shown in Fig. 3. Generally speaking, the small pieces, such as batteries, train control and air brake equipment are located in the end hoods. Here they are readily accessible, and easily connected to the equipment at the engineman's position.

Standard 24 RL air brake equipment is used. An air compressor with a rating of 200 cfm supplies the air. The two storage reservoirs, having a combined capacity of 75,000 cu. in. are located beneath the cab underframe, one at each end of the fuel and water tank.

Duplicate operating cabs with raised platforms at the

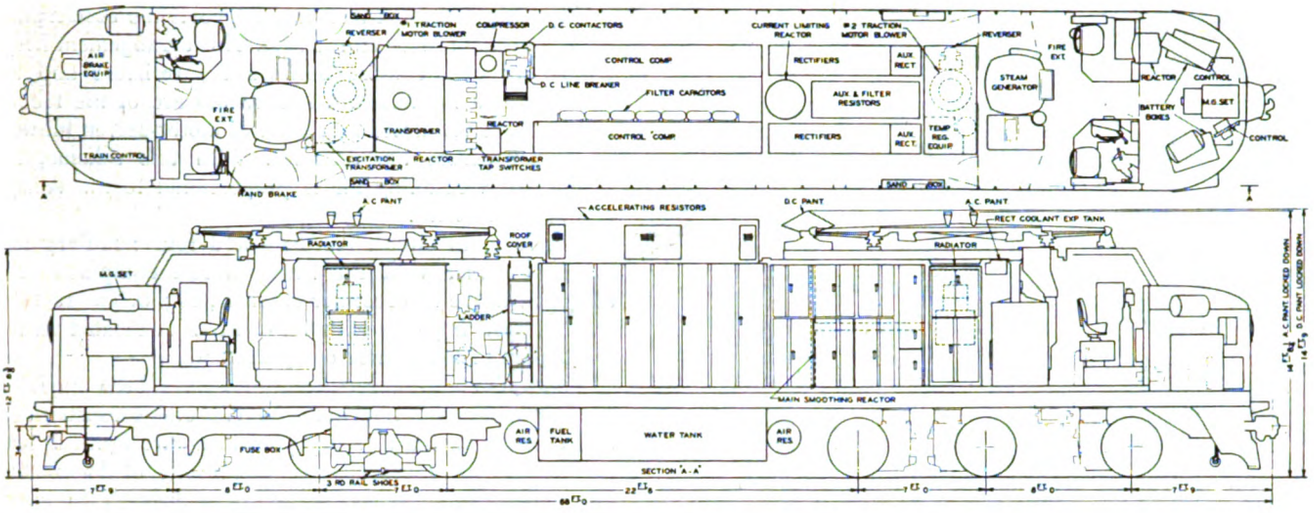


FIG. 3—Location of principal pieces of apparatus in locomotive cab.

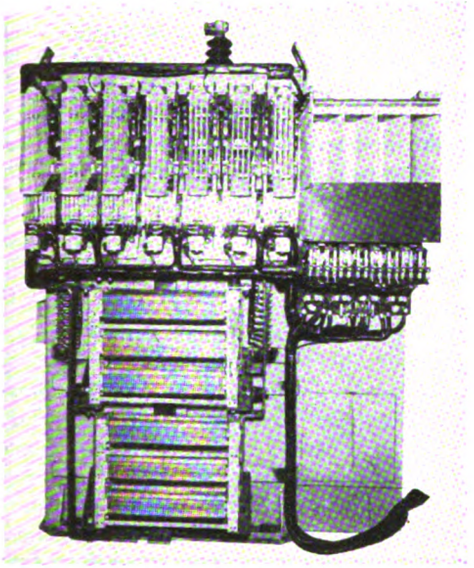


FIG. 4—Main transformer group ready for placement in the locomotive.

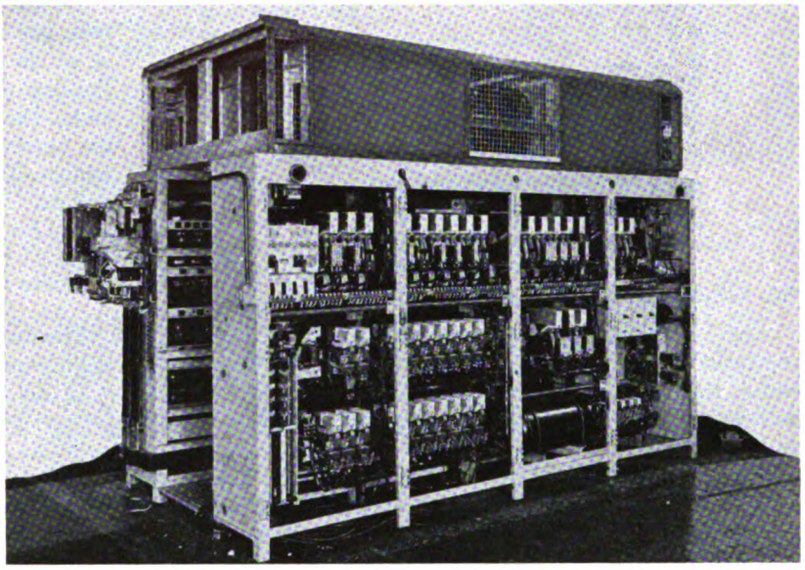


FIG. 5—Control unit consisting of two control cabinets with accelerating resistors and blower mounted above.

TABLE II—COMPARISON OF A-C AND RECTIFIER LOCOMOTIVES

Classification	2C + C2 ooOOO + OOOoo	C-C OOO OOO
Year built	1937	1954
Type	A-c commutator motor	Rectifier
Service	Passenger	Passenger
Hp at continuous rating	4,000	4,000
Length over knuckles	77 ft	68 ft
Weight, lb		
Trucks	159,000	72,000
Cab and platform	72,000	93,000
Equipment	180,000	156,000
Supplies	21,000	27,000
Total	432,000	348,000
On drivers	270,000	348,000
Per driving axle	45,000	58,000
On guiding axles	162,000	....
Per guiding axle	40,500	....

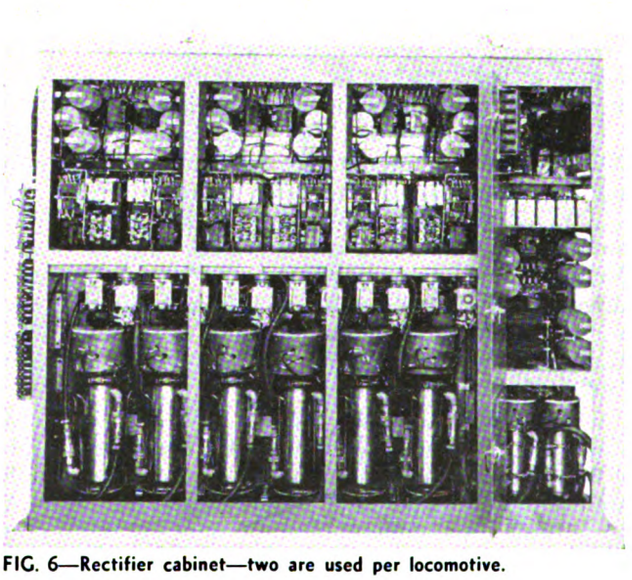


FIG. 6—Rectifier cabinet—two are used per locomotive.

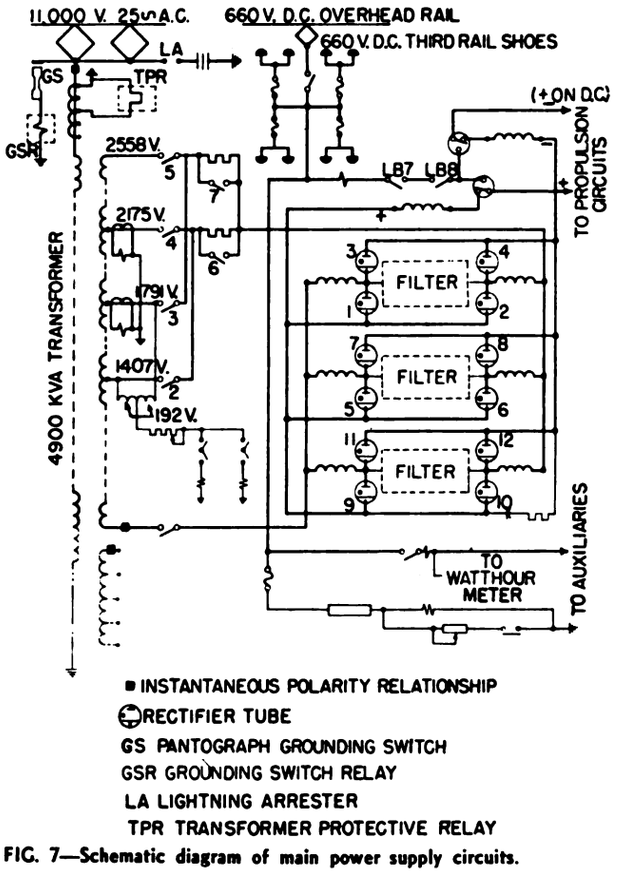


FIG. 7—Schematic diagram of main power supply circuits.

engineman's and fireman's positions, are located at each end of the main apparatus compartment. Controls, brake valves and other equipment are arranged for the safety and convenience of the crew. A steam generator having a capacity of 2,500 lb of steam per hr, is located in each cab. These two generators can be operated together or independently to meet the train heating requirements.

A bulkhead, with doors on each side, separates the operating cab from the main apparatus compartment. An equipment blower at each end of the apparatus compartment furnishes ventilating air for the traction motors, transformer, rectifiers and reactors. It also ventilates the rectifier cooling radiators. Air enters by means of the ducts in the hatch covers, passes through the rectifier cooling radiators into the equipment blowers which discharge it into a duct in the cab underframe. From here, it is distributed to the apparatus as required.

The main transformer, Fig. 4, is designed to utilize the full height of the cab. The high-voltage bushing on top protrudes through the hatch cover to confine the 11,000-volt circuits to the roof. Secondary taps and tap switches are mounted on one end of the tank. The transformer is liquid cooled by means of Pyranol. A motor-driven pump circulates the liquid through the tank and windings to a cooler on the right side of the tank. Ventilating air is forced through the cooler from the duct in the cab underframe.

All of the d-c control, together with auxiliary and changeover switches, is located in the two control cabinets, Fig. 5. Each cabinet faces a side aisle from which the equipment can be easily inspected and maintained. A center aisle between the cabinets gives access to the rear of each and to the filter condenser located there.

The control cabinet structure supports the accelerating resistors and blowers on the roof. This arrangement keeps the length of the leads between the resistors and the switches at a minimum. The resistors are of the ribbon type and are ventilated by means of motor-driven blowers connected across the resistors. With this scheme, the amount of ventilating air is proportional to the voltage across the resistor.

Twelve main circuit rectifiers and four auxiliary rectifiers, together with the firing circuit equipment, are arranged in the two rectifier cabinets, Fig. 6. The rectifier cooling system pump with its controls is located in the lower part of the blower compartment.

Standard eight-in. rectifier tubes have been modified for this application to provide heavier anode construction and changes in the mercury pool to assure ignition contact under the most adverse conditions of locomotive movement. Cooling water is circulated through the tubes, control valves and air-cooled radiators by means of a motor-driven pump.

Two reactors, located between the two rectifier cabinets, are air cooled from the main ventilating duct. One is an air core type reactor with six separate coils for limiting the arc-back current in each of the rectifier circuits. The other is an iron core reactor used to smooth the current ripple in the rectifier output to the traction motors. This is necessary for proper commutation of the motors. The auxiliary motors also have smoothing reactors for the same purpose.

Electric Circuits

The main power circuit arrangement is shown in Fig. 7 and the propulsion circuits in Fig. 8.

In the a-c zone, power is supplied to the main transformer primary from the overhead trolley at 11,000 volts, 25 cycles. It is collected by means of two pantographs mounted on the roof. Either or both can be used as occasion demands. From the transformer secondary, power is supplied through tap switches and current limiting reactors to 12 main rectifier tubes arranged in three separate bridge connected circuits. Power output from the rectifier supplies six traction motors through the changeover switches, the main smoothing reactor, line switches and accelerating resistors. Arrangement of the traction motor circuit provides two motor combinations; three in series, two in parallel on the 1407-volt tap, and two in series, three in parallel on the three higher voltage taps. Voltage variation on the traction motors is obtained by means of the d-c accelerating resistors in the traction motor circuit in combination with the four transformer taps.

In the d-c zone, power is supplied from the third rail at 660 volts. It is collected by means of third rail shoes located on each side of both trucks. Connections are made from fuses through two line breakers and a change-over switch to the accelerating resistors and traction motors. Arrangement of the traction motor circuit provides two motor combinations; two in series, three in parallel, for starting and low-speed operation, and full parallel for high speed operation. Locomotive characteristics are shown in Fig. 9.

Change-over switches, located in the main power and auxiliary circuits and controlled from a single switch at the engineman's position, permit setting up the circuit for either a-c or d-c operation.

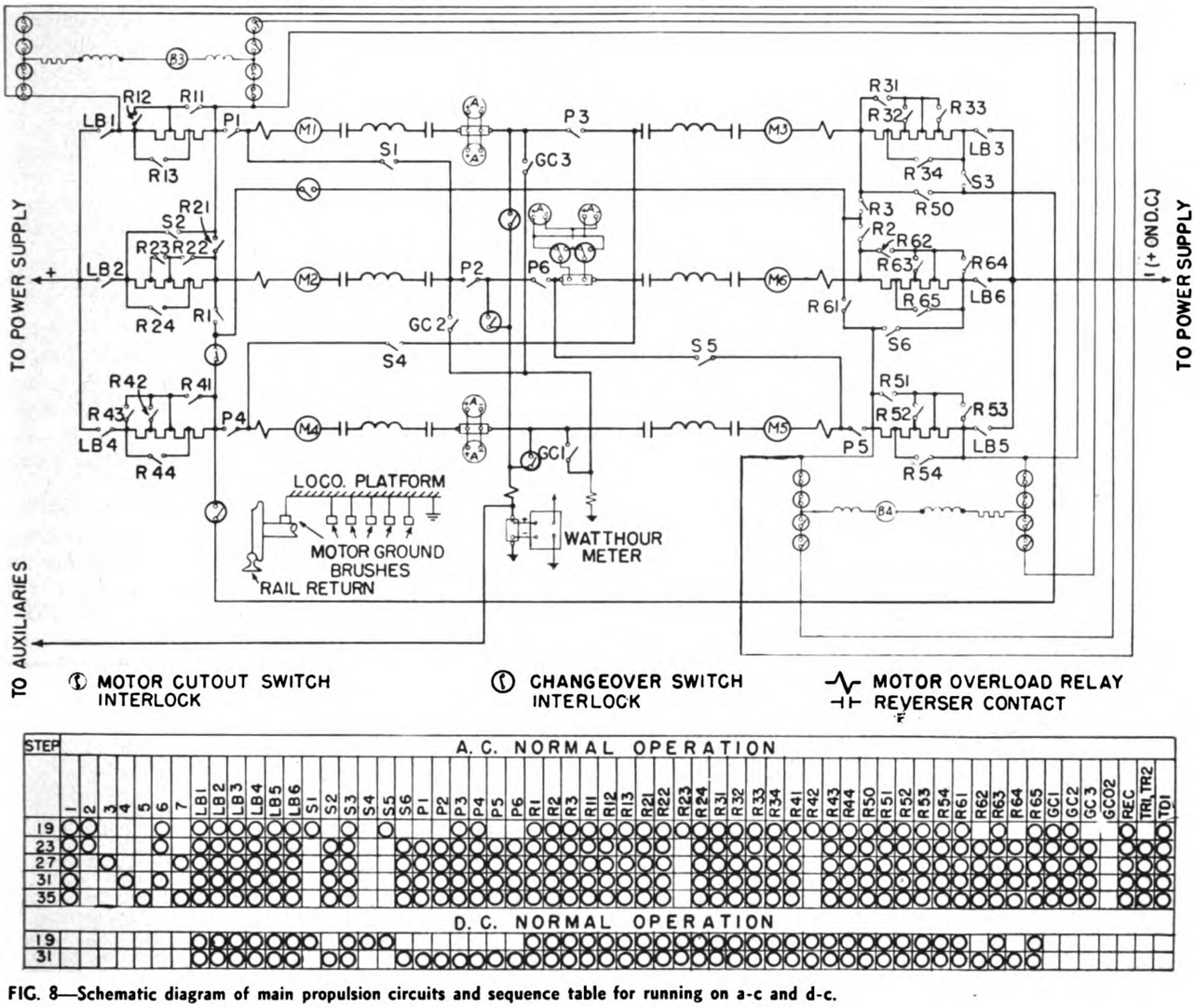


FIG. 8—Schematic diagram of main propulsion circuits and sequence table for running on a-c and d-c.

Auxiliary motors are designed to operate on 660 volts d-c. In the a-c zone an auxiliary rectifier supplies this power from a separate winding on the secondary of the main transformer. Four standard ignitron rectifier tubes arranged in a diametric connection are used. They are water cooled as are the main rectifier tubes from common cooling system. Smoothing reactors are employed in these circuits as well as in the main motor circuit.

Battery charging and control power is provided by means of a motor-generator set. The generator is designed for 75 volts and supplies the electric equipment of the train-heating boilers, the rectifier cooling-pump motor, battery charging and control.

Protection for electric equipment is of two general kinds: overload type for the transformer, traction motors and auxiliary motors; and ground relay type for both the main and auxiliary circuits. The rectifiers are protected by means of current limiting reactors in each circuit and an arc-back relay which removes excitation from the tube firing circuits.

These locomotives are the first built, for present New Haven electric passenger service, with all weight on drivers. Two principal factors have contributed to this favorable design: the conditions of loading on the Park Avenue Viaduct. and the type of truck used.

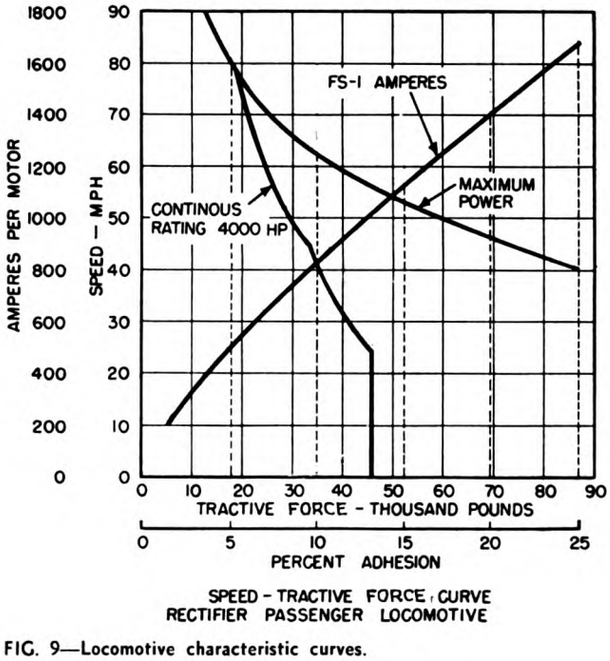


FIG. 9—Locomotive characteristic curves.

The a-c commutator motor type locomotives, built for this service in 1937, weigh 432,000 lb. This load is carried on two three-axle, articulated driving trucks and two two-axle guiding trucks, making a total of 10 axles. The high load concentration resulting from the close truck and axle spacing limited the axle loads to 45,000 lb.

In a recent building program the Park Avenue Viaduct was modernized and its load carrying capacity increased. When the rectifier locomotive was proposed with all weight on two widely spaced 3-axle, swing-bolster trucks, it was approved for 58,000 lb per axle. With 6 axles, this means that the total locomotive weight was limited to 348,000 lb.

A weight comparison of these two types of locomotives, Table II, shows that the new locomotive weighs 84,000 lb less than the locomotive built in 1937 and has 74,000 more weight on drivers. The weight reduction is chiefly in the truck, with the reduced equipment weight offsetting the increase in cab and platform weight.

Recent application of sealed tube rectifiers on locomotives and cars is of significant importance in railway electrification.

In its present state of development, the rectifier tube represents a high power package that can be used effectively in the transportation field. Its ability to convert commercial frequency a-c to d-c power for traction opens up many new possibilities for existing as well as future railway electrification.

Another bright spot in this picture is the program of intensive development and search for new materials and methods. New rectifier materials show promise of even more power in smaller packages with simple control and lower losses. Prospects of reducing costs are also good. These possibilities, together with the fact that highly developed components, such as traction motors and control equipment are available from the diesel-electric locomotives, offer means for reducing the first cost of electric locomotives, an item which has been a barrier to further electrification.

Weight of electric equipment for the rectifier type locomotive is approximately 10 per cent less than that for the a-c commutator type locomotive of the same horsepower rating.

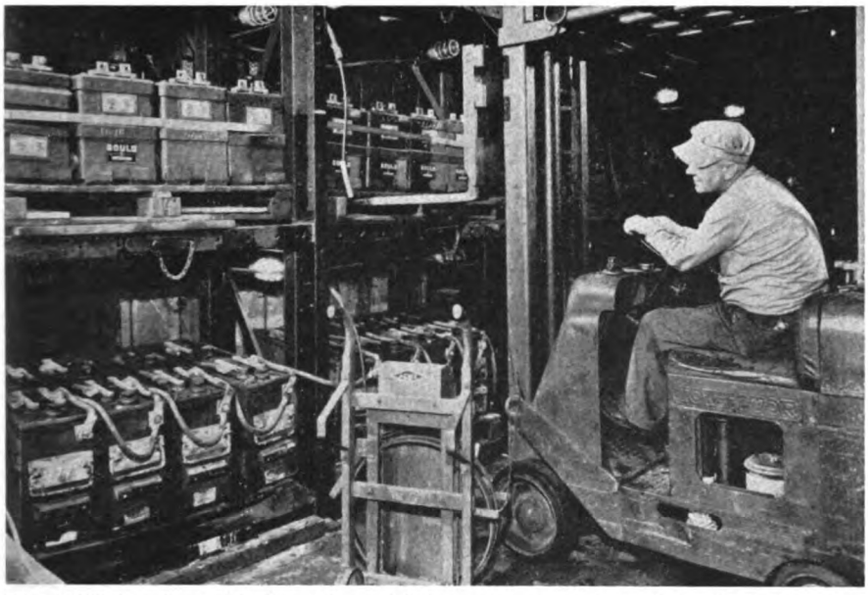
Railroad modernization, combined with progress in both the electrical and mechanical aspects of locomotive design, have produced a new locomotive which has 29 per cent more weight on drivers, yet weighs 19 per cent less than the locomotive built for the same service in 1937.

THIS storage rack with compartments for 75 batteries on pallets is only one section. Compartments for 72 complete batteries are located behind this. Power outlets are available on two lower tiers of this rack so that batteries can be kept up to full charge during storage.

New PRR Pittsburgh Battery Shop

One of the railroad's first battery shops has kept pace with requirements and now maintains four types of batteries

■ The solution of battery maintenance, repair and storage problems involving four different types of batteries at the Thirty-Second Street shop of the Pennsylvania in Pittsburgh, offers many suggestions which can be employed by other battery users. This battery shop is one of the first ever set up and was organized by the Pennsylvania when passenger cars first were lighted with electricity. It is the major battery shop for the Central region of the railroad and receives diesel locomotive batteries, air-conditioning and car-lighting batteries, batteries used in signaling, as well as batteries from industrial trucks.



BATTERIES for air-conditioning and car-lighting passenger service and for diesel locomotive starting are placed on pallets in sets of four trays for ease in handling. Problem is to keep sets together during repair. Steel strapping bands them together as a unit on wooden pallets during storage and until they reach the equipment for which they are ordered.

FACILITIES for complete battery overhaul and rebuilding are available at the Thirty-second Street Shop, including lead-burning by an expert to reconnect a repaired cell.

Upon arrival at the shop, a battery is first cleaned and examined for cracks and other damage that might cause leakage. The leaky containers are repaired, which sometimes requires a new rubber jar or container from a stock of spare parts. If no visible damage to the battery is noted, the electrolyte level is brought up to the proper height and the battery is placed on charge at the finishing rate. If all cells are uniform in voltage, specific gravity is adjusted to its normal value. Using a portable test-discharge unit, mounted on a battery-powered platform hand-truck, the battery is then given a test discharge. Voltage readings of each cell are taken at regular intervals, to determine the condition of each cell, and to detect those cells which are not satisfactory. A simple diagram of the cells in the battery is made, on which is noted all pertinent information regarding starting and finishing specific gravity, voltages of each cell during test and temperature readings. If a satisfactory discharge test is not obtained on the first cycle, the battery is given two more test discharges. If the battery as a whole fails to give at least 80 per cent capacity, all pertinent data on the faulty battery is sent to the electrical engineer in Philadelphia, Pa., for recommendation on its disposal or reclamation. If only a few cells of a fairly new battery indicate low capacity, these individual cells may be replaced.

If inter-cell connectors are drilled to remove the individual cells, lead-burning equipment and expert personnel are available to return the connectors.

After a complete battery has been cleaned, test-discharged satisfactorily and painted, it is ready for storage or immediate service.

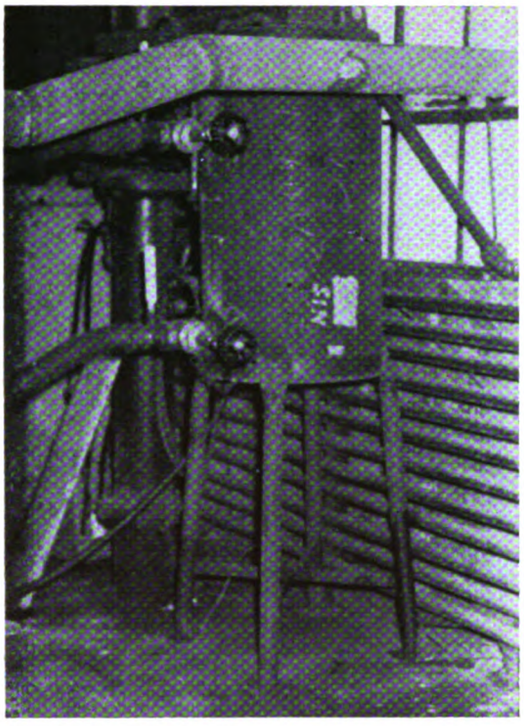
Batteries for passenger car-lighting and air-conditioning or diesel locomotive service are placed on pallets in sets of four trays for ease in handling in and out of the battery compartments on cars or locomotives. In large operations, such as the Thirty-Second Street shop, it is somewhat of a problem to keep the original sets together as a unit. This is easily accomplished by securing the four trays together with steel strapping on a wooden pallet.

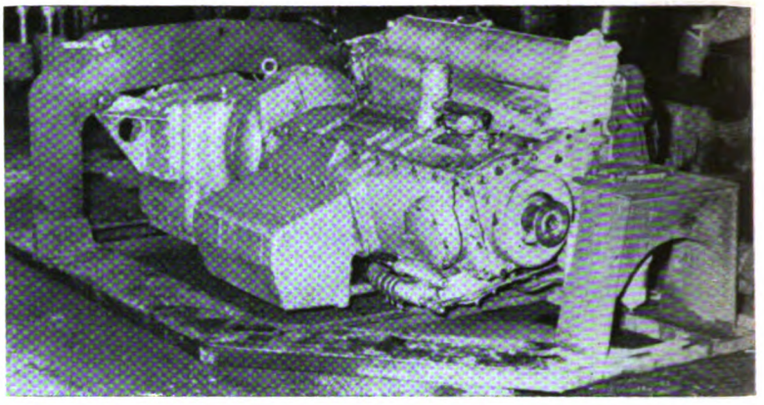
There is considerable storage space for batteries in the shop, one large storage rack consisting of 72 bays (4 high), with each bay accommodating one complete battery on standard wooden pallets. There is another large storage rack of 75 bays arranged in three tiers each. Realizing the importance of sending out batteries in a fully charged condition, the first two tiers in this storage rack are fitted with charging outlets so that batteries can be given a booster charge periodically if they are stored for a long time or just before they are shipped. The lowest tier is often used for batteries undergoing test discharging.

Power for battery discharging is obtained from two motor-generator sets which can furnish up to 1,000 amp. The power distribution system within the shop is very flexible. There are outlets at convenient points on the charging tables for the smaller batteries as well as outlets throughout the storage rack mentioned above.

Depending upon the season, this shop handles up to 20 sets of batteries per week. The summer season is the busiest because of the heavy load put on the air-conditioning batteries during the summer months.

The generator which charges the car-lighting and air-conditioning batteries while the car is traveling on the rails is driven by a belt or mechanical drive from the car axle. It is impractical to adjust the voltage regulator while the car is in service. An efficient, portable rig for simulating operating conditions has been devised by A. N. Fox, assistant foreman, consisting of a 220-volt a-c motor to which is attached a flexible shaft with a clamp on the end. Mounted on wheels, the rig is placed in the proper position beneath a passenger car in the yard and the motor is plugged into a nearby power outlet. The belt connecting the charging generator to the axle of the car is disconnected and the clamp on the end of the flexible shaft is connected to the generator. The reversible motor is brought up to speed in both forward and reverse directions while the voltage regulator inside the car is adjusted.





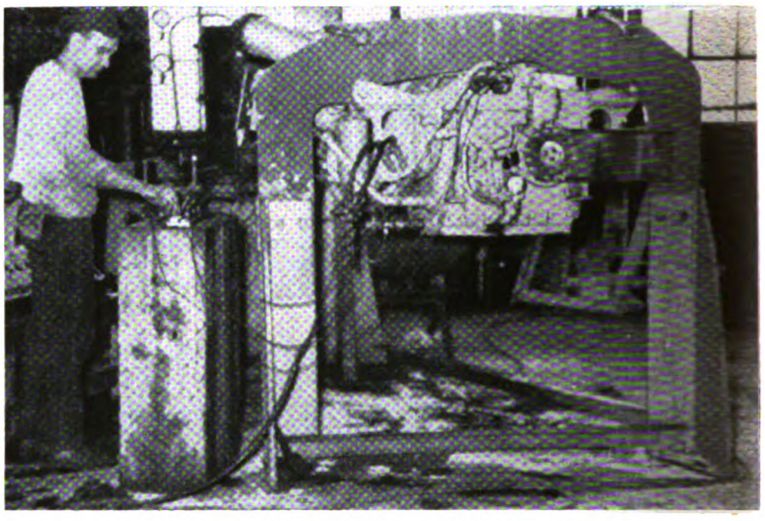


Fig. 1 (upper right)—The shipping stand provides a safe way to ship car engines without damage.

Fig. 2 (above)—The temperature of the jacket water which flows through this tank is controlled by a thermostatic valve which admits tap water to the tank.

Fig. 3 (right)—End view of the test stand showing the torque arm (at the right) which is used to lock the transmission.

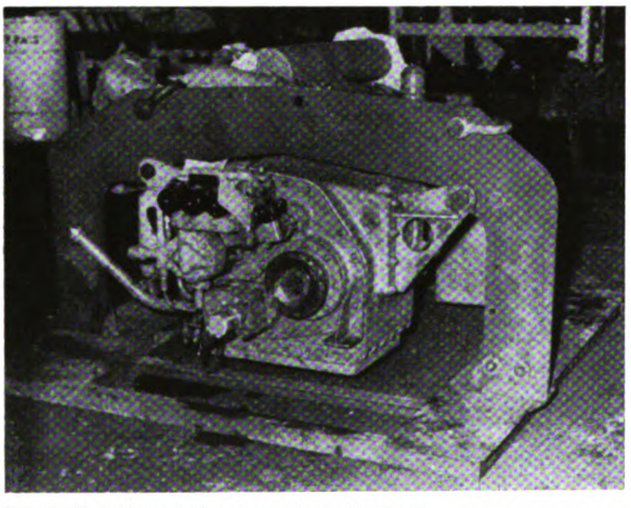


Fig. 4—End view of the stand shown in Fig. 1.

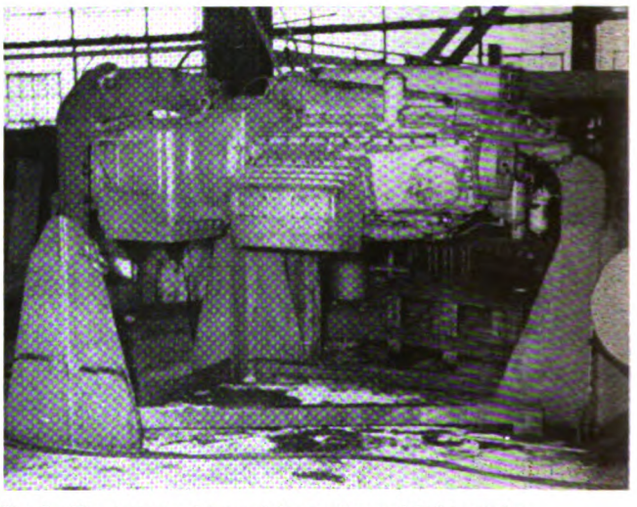


Fig. 5—The test stand is used for testing and light repairs.

B&M—Developed Stands Ease . . .

R.D.C. Engine Shipping & Overhaul

■ No General Motors power plant, used on Budd R. D. C. cars on the Boston & Maine, has been damaged in shipment since the railroad developed the shipping stand shown in Figs. 1 and 4. Engines due for overhaul are removed from cars at Boston, Mass., and Westboro, N. H., and shipped to the North Billerica, Mass., shops for repair.

If an engine is ready for overhaul when it arrives at

the shop, it is stripped and given general heavy repairs. When reassembled, it is placed on the test stand shown in Figs. 3 and 5. From the illustrations, it may be seen that the yoke which supports the transmission end of the power plant is a part of the test stand as well as the shipping stand.

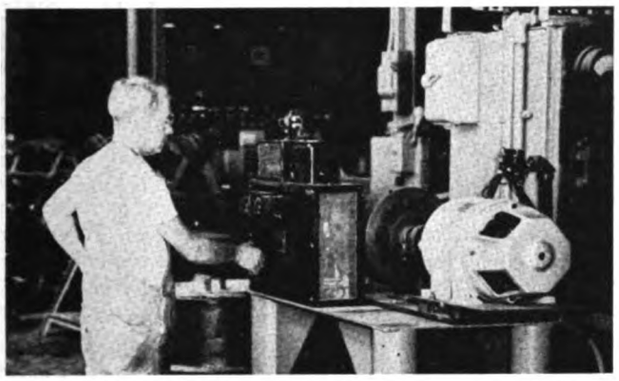
If the engine is in need of only light repairs, they are made on the test stand. Being able to run the engine on the test stand aids materially in making an accurate diagnosis of engine requirements.

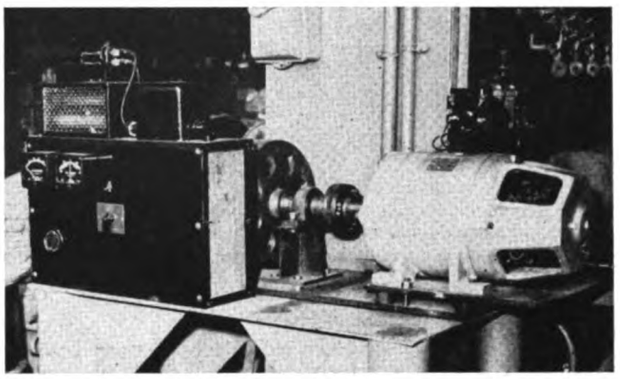
Following either light or heavy repairs, the engines are tested with their transmissions. For this purpose, the torque arm which may be seen at the right in Fig. 3, is used to lock or hold the drive-shaft end of the transmission.

The engine is tested at idle and three running speeds with the torque converter acting as a load. Finally, the torque arm is removed and the engine is brought up to a speed, equivalent to road operation, of about 50 mph which causes the transmission to go into direct drive. This action cannot take place while the transmission is being used as the load, since the necessary relay action is instigated by car or drive-shaft speed.

For the purpose of engine control during tests, knife switches are used to take the place of controller contacts. These are shown on the box at the left in Fig. 3. The engine is run for periods up to eight hours while records are made of water and transmission oil temperature and settings are made to insure proper operation of high temperature and low oil pressure switches.

During the test, the engine jacket water is circulated through the tank shown in Fig. 2. City water is also piped into this tank and there is an overflow at the top. A thermostatic valve, governed by jacket water temperature, controls the temperature of the water in the tank by controlling the amount of city water admitted to the tank.





LEFT—Motor on the eddy current brake test stand. RIGHT—The test panel is equipped with a brake excitation rheostat, voltmeter and ammeter showing motor load. A flame ignition transformer and spark gap are mounted atop the test panel.

Eddy Current Brake Assures Motor Performance

■ When a steam generator motor is overhauled and returned to service from the Santa Fe's San Bernardino, Cal., shops, the operators know it is in first class condition and that it will carry load in excess of its rating without damage to the motor. The motor is used to drive a blower, a fuel pump and a water pump, and there is also a 50-volt, 60-cycle take-off which supplies the primary of the flame ignition transformer. The secret of accurate testing and adjustment is a shop-made, eddy current brake.

When a motor is to be overhauled, it is dismantled, cleaned with a steam jenny, dried in a baking oven for 24 to 48 hours at 300 deg F and checked for grounds and shorts. If its condition is satisfactory, the commutator is turned and undercut and the armature is dipped in insulating varnish and baked for 24 hours at 300 deg F.

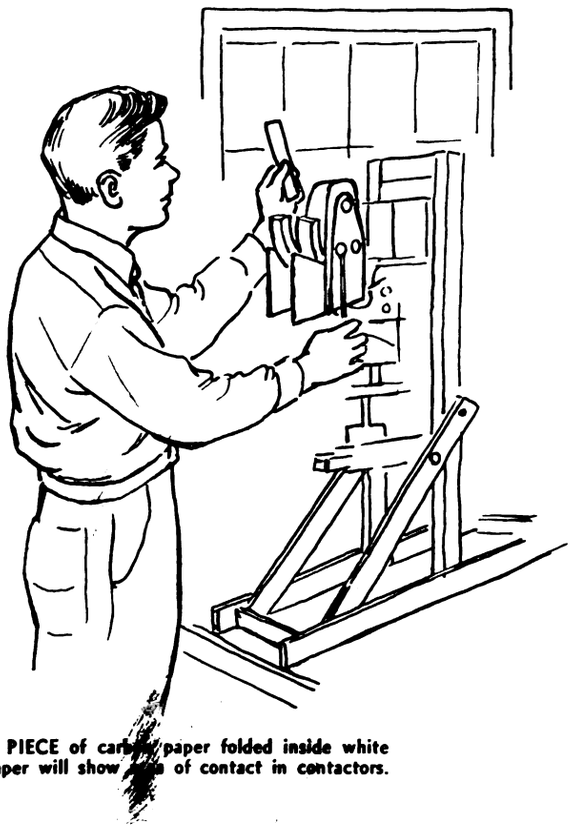
Bearings are cleaned in a degreaser with trichlorethylene. Re-usable bearings are packed with lightweight, high-temperature silicone grease.

The eddy current brake, which is driven by the motor under test, consists of a steel wheel or drum open at one end. Inside the drum, and supported at the end away from the motor, is an exciting field consisting of a ring of electro magnets. These magnets produce eddy currents in the wheel and create torque or drag on the motor. The amount of torque is controlled by a rheostat on the test panel which controls the amount of excitation. A series of holes in the face of the wheel provide ventilation for removing the heat generated by the eddy currents.

A flexible coupling between the motor and the brake makes attachment easy, and allows for any minor misalignment. The brake is excited with current values up to 5 amp. at 74 volts. During test, the motor is protected by a time delay relay.

When a motor to be tested is connected to the brake, it is started with a step starter, and run at no load on 74 volts. Load is applied and increased gradually to 85 amp. Speed is measured with a hand tachometer and brushes are advanced or retarded until it is 1,800 rpm. To obtain this speed at this load, it is necessary to relocate the brushes from their original position.

The motor is then loaded to 120 amp—100 per cent overload—for 10 to 20 seconds, while a check is made of commutation. If there is no arcing, its condition is considered satisfactory.



A PIECE of carbon paper folded inside white paper will show area of contact in contactors.

Why the Load Was Lost During Transition

By Gordon Taylor

■ About the middle of July, Unit 5039 had several reports of ground relay action, and a flashover of all traction motors with a flashover of the main generator.

The motors and generator were given a thorough cleaning. A test then developed the fact that the wheel slip relay was inactive at the time of ground relay action, due to a broken wire running from the *EF* interlock to the bus bar on S-14 and the P-1 contactor. The broken circuit was repaired and the unit returned to service.

Later, reports began coming in saying that the engine would drop load during transition from No. 2 to No. 3. Several inspections were made, but nothing definite was found to be the cause of trouble.

Finally a fireman reported as follows:

In making transition from No. 2 to No. 3, the engine drops load as soon as load meter shows about 300 amp. The wheel slip relay also closes, but wheel slip light does not burn. That was the best tip that had been received. The unit was moved into the shop for a thorough test to locate the trouble. It was first necessary to ask and find answers to a few questions.

The first question was why did the wheel slip relay close and wheel slip light fail to burn? That was easy, the lamp was burned out.

The second question was, if the wheel slip relay closed, what did that have to do with engine unloading? It is the wheel slip relay's job to unload the engine, and it was doing its job as intended when wheel slip occurred.

The third question was, why did wheel slip occur during transition from No. 2 to No. 3? The fireman had stated that the engine would unload when the current reached about 300 amp. The problem was then to locate any condition which would cause one of the two wheel slip relays to pick up due to a difference in potential of the points across which it is connected.

Since the traction motors had recently been involved in flashover trouble, they were very carefully rechecked to be certain they were in good condition. They appeared to be okay, so a very careful check was made of the control system and power panel.

Since there was no trouble reported in transitions No. 1 and No. 2, special attention was given to all contacts that would come into action when the circuits were set up for transition No. 3.

When the parallel contactor P-2 was examined, it was found that the contact tips were not making contact across the full face area of contacts. In fact, the contacts were touching only along the outer edge at one side, an area of about one fifth of the contact face. This poor contact could very well explain the unbalanced condition in the motor circuits that caused the wheel slip relay to act every time the P-2 contactors closed when making the No. 3 transition. It was then decided that the P-2 contactor was the villain in the case.

After the power contactors were all checked and placed in proper contact, the unit was given a road test and gave very satisfactory performance.

When the power contactors were examined, it was found that a piece of stiff paper could be inserted for a considerable distance between closed contacts. To check on that, a piece of carbon paper was folded with carbon sides out, and laid within a folded strip of white paper that was of a width that could be passed between power contacts.

The power contacts (with power off) were closed by air pressure. When the carbon and folded paper were removed from the contactor, a perfect imprint was on the paper, showing the area of contact. This revealed that there was contact on only about one-fifth of the area.

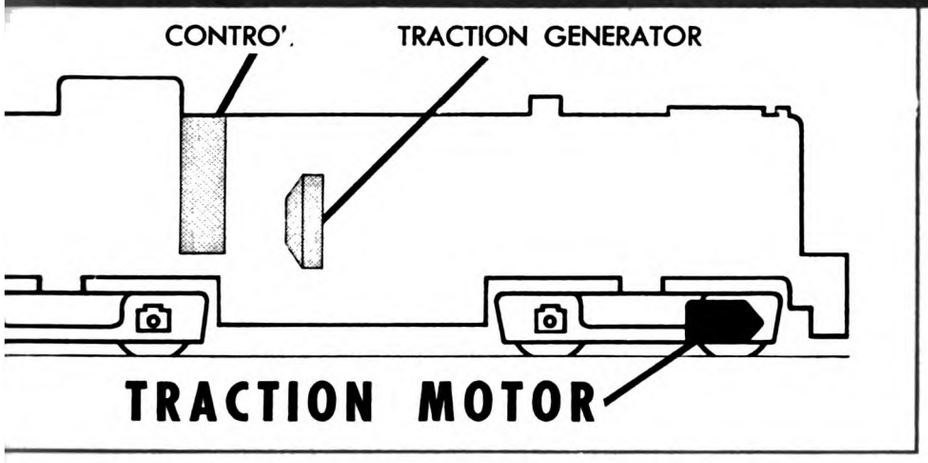
The question arises as to why contacts were out of line. It was found that two bolts that fasten the upper contact holders had to be loosened and the holder frame was moved into position so that the main power contacts would make contact across the entire area. This was much better than attempting to file the contacts to make full face contact.

It is, therefore, recommended that when new power contacts are applied that a careful check be made to be certain that contacts are making as full contact as possible by making carbon paper impressions.

It is also recommended that wheel slip lamps be checked periodically to see that they are in working order. Had we known in the beginning that the wheel slip relay was involved, it would not have been difficult to locate the trouble.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

3 REASONS WHY THE G-E TRACTION SYSTEM SETS THE INDUSTRY STANDARD



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G-E traction motors give you 15% MORE CONTINUOUS TRACTIVE EFFORT

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MOTOR OVERHEATING ELIMINATED

With 65-mph gearing, the GE-752 is the nearest thing yet to a self-protected traction motor. Unless your operation is most unusual, you can forget about short-time ratings with this gearing. Motor torque will slip the wheels long before the current developed is high enough to cause motor failures.

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The capacity of this traction motor is helping many railroads attain better locomotive utilization, an important factor in lowering operating costs. For example, when your locomotive is equipped with G-E motors geared to 75 mph, it still has a high enough continuous tractive effort to permit dual-purpose operation. In most cases you have the speed to meet express and passenger schedules without sacrificing the tonnage-hauling capacity for freight. Locomotives with GE-752 motors geared to 75 mph are equally adaptable to divisions with level runs and those where mountain grades are encountered.

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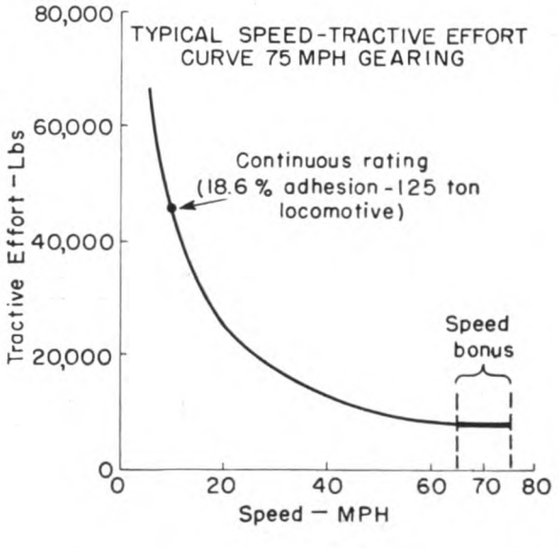
SEPARATELY MOUNTED PINION requires lower maintenance. Largest in standard use, 4¾-in. pinion shaft reduces chance of fatigue breakage.

DUAL-PURPOSE 75-mph gearing of GE-752 motors provides continuous tractive effort into the self-protecting slipping range, as well as a bonus of 10 mph in top speed.



LARGEST PINION-END BEARING in railroad use can take heaviest duty. Sealed bearing needs no inspection between overhauls.

Questions and Answers

Interchange Rules

This is the fourteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

151-Q—Why was the former allowance of 3% for vacation expense specified in Paragraph (g-4) of Rule 2 changed to 4% in the 1955 Code?
A—Because of similar change in A.A.R. labor rates brought about by present payments now made certain holidays not actually worked.

152-Q—Does the addition of new Paragraph (3) to Section (s) of Rule 3 mean that on and after January 1, 1956, cars built new or rebuilt shall be equipped with automatic type slack adjusters complying with A.A.R. Standard Specifications and having Certificate of Approval?
A—No. This new paragraph simply requires that where car owners voluntarily elect to equip their cars on and after January 1, 1956, with automatic slack adjusters such slack adjusters comply with A.A.R. Standard Specifications and be covered by A.A.R. Certificate of Approval.

153-Q—Why is it so important that hereafter all car owners arrange to check the condition of initials and numbers of their freight car equipment before cars are released from their shops or their principal repair tracks?
A—Because under the provisions of new Paragraph (s-8) which was added to Rule 3 cars offered in interchange from owners on and after January 1, 1956, may be rejected by receiving road where stenciled initials and numbers are not legible.

154-Q—Is it permissible to use the new design Wabcoseal Angle Cock on Cars which move in general interchange service?
A—Yes. See Interpretation No. (a-4) to Rule 17; also note following Item 2 of Rule 101.

155-Q—What is the purpose of new Rule 27 which was added in the 1955 Code?
A—To provide for periodic dismantling of geared hand brakes for the inspection of internal concealed parts so as to be able to correct any adverse conditions and thereby insure more efficient hand brakes in service.

156-Q—Why was new Paragraph (a-1) added to Rule 61 in the 1955 Code?
A—To indicate that all car owners are expected to periodically remove trucks from under their cars and dismantle same to the extent necessary for complete inspection of all details for the purpose of detecting and correcting all conditions which may contribute to hot boxes or other truck failures.

157-Q—Why is it important that the requirement with respect to Alternate Standard tubular axles as outlined in new second paragraph of Rule 84 be closely observed?
A—Because the strength of a tubular axle depends on heat treatment when manufactured and subsequent overheating of journals can and does reduce its original strength characteristics to an undesirable extent. (Incidentally, tubular axles are no longer being manufactured.)

158-Q—Why are certain draft gears sometimes transferred from Section I, List of A.A.R. Approved Draft Gears, Rule 101, to Section II, List of Non-Approved Draft Gears, in the same Rule?
A—Because check tests of such gears at the A.A.R. Laboratory after specified periods of service have developed losses in certain requirements necessary for A.A.R. Approved Drafts Gears under existing Specifications.

159-Q—Under what conditions may a straight labor charge be rendered versus car owner for lowering and raising auto loading device rack in car even though performed primarily for inspection purposes?
A—In cases where inspection of such lowered rack discloses necessary repairs and such repairs are made thereto, an additional labor charge of 0.2 hr. is permissible for the raising and lowering work.

American Locomotive Diesel-Electric Locomotives

This series of Questions and Answers pertaining to Alco diesel-electric locomotives with General Electric electrical equipment is a continuation of a series, the first of which was published in the October 1950 issue of Railway Mechanical & Electrical Engineer. The references to manuals and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

1137-Q—What action follows?
A—Remove locking wires from studs. Pry off catcher. Be sure not to nick its inner surfaces.

1138-Q—What attention should the oil catcher receive after removal?
A—Clean with suitable solvent, making certain that the oil catcher grooves and oil return channel to the crankcase are clean.

Installation

1139-Q—How should the oil catcher be located?
A—When applied to the generator adapter, it should be centrally located with respect to the crankshaft flange.

1140-Q—Describe the operation to install the oil catcher.

(*Continued on page 78*)

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(*Continued from page 74*)

A—Renew the gasket. Install the ream bolts if old oil catcher is reused with former adapter.

1141-Q—What should be done if a new oil catcher is used?
A—Center oil catcher with respect to crankshaft flange, drill, ream and apply ream bolts. Replace nuts, tighten and apply cotter pins. Replace nuts on all of the studs, tighten and lock wire.

Traction Generator

(Manual TP-500 page 512)

1142-Q—How are the generator fans balanced?
A—Dynamically, and may or may not have weights installed in place.

1143-Q—When equipped with welded weights, should they be removed?
A—The welded weights should not be removed under any circumstances.

1144-Q—Are the fans interchangeable?
A—Yes, on all generators.

1145-Q—What is done to provide for addition of weights if necessary, for balancing the diesel?
A—There are also three sets of holes drilled in the fan, 120 degrees apart, to be used for this purpose.

1146-Q—Which installations do and which do not require additional balancing?
A—Generators with gear driven auxiliaries do not require it, but it may be required on generators with belt driven auxiliaries.

Removal—Generators with Belt Driven Auxiliaries

1147-Q—What should be done preparatory to removal of generators with belt driven auxiliaries?
A—Set the crank nearest the generator on vertical top center.

1148-Q—How is this done?
A—Use a tram between the holes in the turning device housing and the worm gear, or by setting the No. 1-6 (12-cylinder engine) or 1-8 (16-cylinder engine) midway between pointers (22½ degrees from each pointer). Mark the edge of the generator fan and the generator frame.

1149-Q—What is the purpose of these marks?
A—These marks will insure the proper location of the balancing weight holes in the generator fan with relation to the crankshaft when applying the generator to the same engine.

All Generators

1150-Q—What is the initial operation to effect removal of all type generators?
A—Apply lifting hoist and take slack. Insert cardboard or similar material in air space between armature and field poles to prevent armature dropping when generator spider flange is disengaged from the crankshaft flange.

1151-Q—Describe the operation further.
A—Remove generator coupling bolts and bushings through engine base doors nearest adapter. Remove nuts from generator adapter studs that secure generator to adapter.

1152-Q—What is the final operation?
A—Pull generator from adapter using pry bars whenever necessary to guide generator and prevent it from binding. Remove upper shims, tagging them so that they may be reapplied in their original position.

Installation—Reapplying to Same Engine with Belt Driven Auxiliaries

1153-Q—Describe the initial operation for reapplication to the same engine.
A—Rotate engine crankshaft until the crank nearest the generator is on top vertical center. Align mark on generator fan with that on generator frame. Insert cardboard or similar material in air space between generator armature and field poles.

1154-Q—What operation should follow?
A—Attach slings and mount generator on adapter studs. Coat the couplings bushings lightly with white lead. Install bushings in the holes in crankshaft flange.

Fairbanks-Morse
Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F146-Q—Describe this breaker further.
A—It is of the double throw type and also energizes the auxiliary generator field and exciter battery (4 pole) field.

F147-Q—What takes place if this breaker trips?
A—The engine will starve for fuel and the ac failure alarm will come on.

F148-Q—What is the color of the surge relay light and where is it located?
A—The color is white. On some units this light is located on the forward side of the electric cabinet. On A units it is in the operating cab behind the engineer.

F149-Q—Name the colors of the other lights.
A—Ground relay, white; low oil pressure, yellow; a.c. failure, blue; hot engine, red; steam generator off, green; stuck starting contactor, white (provided only on Railroad Specification).

F150-Q—What are the positions of the Isolater lever?
A—Start, Isolate and Run.

(*Continued on page 82*)

How OXWELD Trade-Mark Welding Rods Keep Diesels in Service

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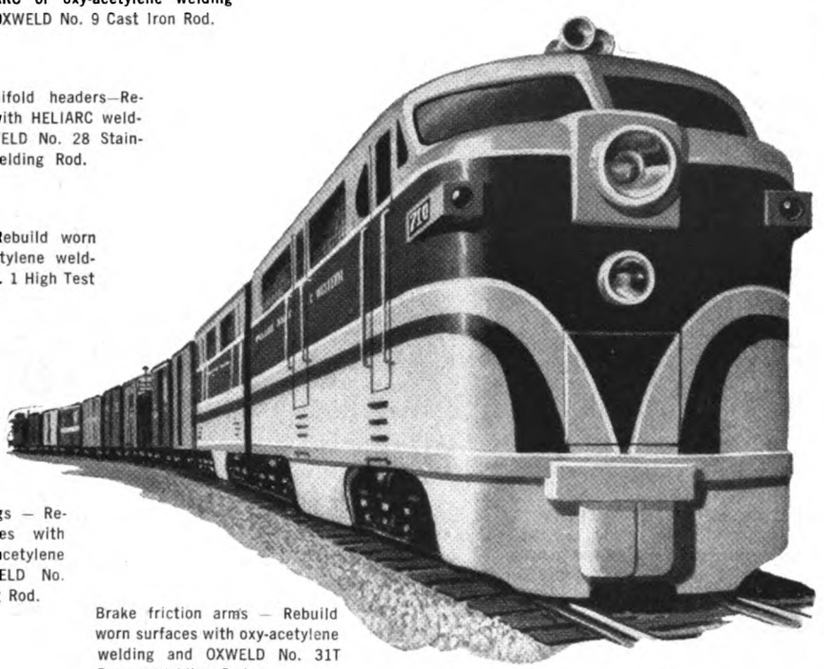

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Axle thrust bearings – Renew worn surfaces with HELIARC or oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Brake friction arms – Rebuild worn surfaces with oxy-acetylene welding and OXWELD No. 31T Bronze Welding Rod.

Malleable iron brake heads—Rebuild worn surfaces with oxy-acetylene welding and OXWELD No. 25M Bronze Welding Rod.

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(*Continued from page 78*)

F151-Q—What takes place in Start position?
A—Handle pulled to right and upward against spring pressure. Starting contactors G+ and G— are energized, connecting the main generator to the batteries to start the engine.

F152-Q—What is the result in Isolate position?
A—Handle upward, engine is said to be "Isolated" or off the line and will remain at idling speed regardless of throttle position. Power contactors P-1 and P-2 cannot close.

F153-Q—How does this affect the power delivered?
A—Power cannot be delivered on the unit, either in motoring or dynamic braking. Other units are not affected.

F154-Q—In this position, will the alternator failure alarm operate?
A—No.

F155-Q—How is the throttle affected?
A—The engineer's throttle in stop position will not shut down on engine which has been isolated.

F156-Q—How are engine stop buttons affected?
A—The engine stop push button on the engine control panel is operative only with the isolater in ISOLATE position. The emergency engine stop button on the engine is operative at any time.

F157-Q—What takes place in RUN position?
A—Handle downward. This places the engine under the engineer's controls or "on the line."

Engine Stop Button

F158-Q—How does the engine stop button stop the engine after it is isolated?
A—By energizing the D solenoid on the governor.

F159-Q—What other condition is required for the button to be operative.
A—The Control Cut-Out breaker on electrical cabinets must be on ON for this button to operate.

Emergency Stop Button

F160-Q—Locate and describe this button.
A—This is a large red push button located on the engine above the governor.
(Bulletin 1706—101-A, page 26)

F161-Q—What is the function of the emergency engine stop button?
A—Its function is to manually trip the engine overspeed safety mechanism to stop the governor in an emergency. Operation of the button is entirely independent of the governor or engine control panel stop push button electrical circuits.

Engine Overspeed Reset Lever

F162-Q—Where is this lever located?
A—On the engine above the governor.

F163-Q—How is the Overspeed Reset Lever manipulated?
A—To reset, pull lever as far as possible in the direction of the arrow until it latches.

F164-Q—What happens if an engine shuts down because of the overspeed tripping?
A—Alarm bells will ring in all units and a blue light will show on the engine control panel of the unit affected.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G141-Q—In what position must the isolation switch be placed to obtain power from the unit?
A—The switch must be placed firmly in the RUN position to obtain power from the unit.

G142-Q—When should the switch be opened or closed?
A—Only with the engine at idle speed or stopped.

G143-Q—How is the engine brought to idle or stop when the locomotive is under power or in dynamic braking?
A—Use the manual layshaft lever to bring the engine to idle or stop under these conditions.

G144-Q—What precaution should be taken?
A—The isolation switch should not be placed in RUN when other units are in dynamic braking.

Engine Governor

G145-Q—What type of engine governor is used on these locomotives?
A—An electro-hydraulic Woodwarl P. G. govenor.

G146-Q—How does the governor function?
A—The engine speed is controlled by the throttle through the governor.

G147-Q—What feature does the governor include, and when is it used?
A—This governor includes an unloader (ORS), used during transition or when the throttle is in IDLE.

G148-Q—What would cause the governor to stop the engine?
A—Low oil pressure or high vacuum on the suction side of the lube oil pump.

G149-Q—What are the indications for such a condition?
A—The alarm bells will sound in all units of the locomotive; the yellow Low Oil and the blue Alternaton Failure signal lights will show in the unit affected.

G150-Q—When the governor safety control stops the engine, what must be done to extinguish the Low Oil alarm light?
A—A push button on the front of the governor housing moves out approximately 3/8", exposing a red band around the shaft of the button. This push button must be pressed in (reset), to extinguish the Low Oil alarm light.

G151-Q—What must be done to extinguish the Alternator Failure alarm light?
A—The isolation switch must be moved to START position.

G152-Q—What must be done to stop alarm bells?
A—Both of the above actions are necessary.

G153-Q—Will the push button trip in any case?
A—No, only if the engine is stopped by oil trouble.

G154-Q—Can the engine be started if the push button is not reset?

(*Continued on page 84*)

THE ENGINEER'S REPORT

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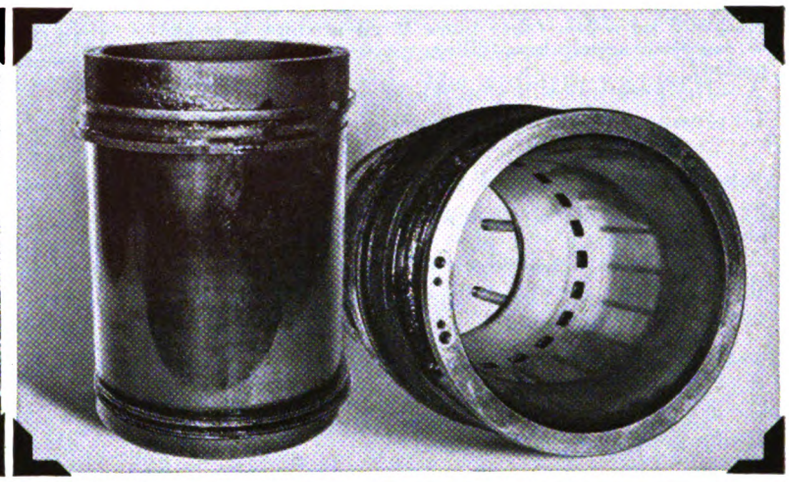
504,851 freight miles in 3 years without overhaul!



ONLY 0.002 INCH WEAR was miked on liners of this locomotive's engines when they were inspected after 504,851 actual miles. Lubricated with RPM DELO Oil R.R., the engines operated without trouble of any kind during 3 years of tough service hauling freight over the Continental Divide. Representative piston and liner, above right, shown as they appeared when taken from one of the engines, demonstrate good condition of parts after this extended service. All rings were free when engine was torn down. Overhaul was performed only because of time and mileage on engine, which was estimated to have idled the equivalent of 100,000 miles in addition to actual mileage. Besides low wear of liners, other wear measurements (inches) were only: Wrist Pin—0.001; Wrist Pin Bushing—0.0015; Carrier Bushings—0.0015; Oil Ring—0.003.

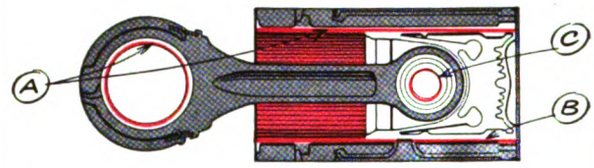
REMARKS: Great Northern Railway's diesels haul heavy freight up grades as severe as 1.8%. Engines operate in dust and heat in summer, snow and extreme cold in winter.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

(*Continued from page 82*)

A—No. Push button must be reset before the engine can be started.

G155-Q—What time delay is provided?
A—When the engine is started and run at idling speed. the governor will stop the engine after approximately forty seconds, if the condition still exists which caused the original shut down.

G156-Q—Why is this time delay provided?
A—To allow a check to determine the cause of shut-down.

G157-Q—What precaution should be taken in this respect?
A—The engine should not be repeatedly started if the governor persists in shutting the engine down.

G158-Q—What action takes place if an attempt is made to run the engine above idling speed during the delay period?
A—The governor will stop the engine at once if the oil pressure is low or the oil pump suction high.

Layshaft Manual Control Lever

G159-Q—How is the layshaft manual control lever connected?
A—The layshaft manual control lever is attached to the end of the injector control shaft at the left front corner of the engine.

G160-Q—What is the function of this lever?
A—This lever may be used to manually shut down the engine or to bring the speed to idle. (As when taking the engine "off the line.")

G161-Q—In what other way can this lever be used?
A—To facilitate the starting of a cold engine.

Engine Overspeed Trip

G162-Q—Where is this device located and what is its function?
A—Located in the front end of the engine, this device will trip and bring the engine to a stop when engine overspeed prevails.

G163-Q—At what speed will this happen?
A—Exceeding approximately 910 rpm.

Schedule 24 RL Air Brakes

1803-Q—What is function of relay T shown on plate 13?
A—This relay serves to disconnect the Wheatstone bridges from the train line circuit when the brakes are applied.

1804-Q—When is this relay energized?
A—This relay is normally energized and is caused to assume the release position when the brakes are applied as will be explained later.

1805-Q—Describe the flow of current to energize relay T.
A—Plate 13 shows that the relay is normally energized by current flowing from the B+ supply through the limiting resistor R24 and through the coil of the relay.

1806-Q—What completes the connection between the Wheatstone bridge and the application magnet wire?
A—When the brakes are released and relay T is energized, its contacts C1-C2 and B1-B2 are closed, completing the connection.

1807-Q—What happens when relay T goes to its release position?
A—Contacts C1-C2 and B1-B2 are opened, thus opening the connection between the bridge and the application train line wire.

1808-Q—Describe these contacts.
A—Contact C1-C2 is a heavy duty contact, while B1-B2 is a low resistance contact.

1809-Q—What is condenser C4 used for?
A—It is used as an arc suppressor.

1810-Q—What other contact is closed when relay T is energized?
A—Contact B3-B4.

1811-Q—What connection does this contact make?
A—Connects B+ to the Wheatstone bridge at resistor R1 and to the W, X and V relays at resistor R13.

1812-Q—What is responsible for removal of battery supply from the bridge and pulsing relays?
A—When the brakes are applied, contact B5-B6 opens. thus removing battery supply to the bridge and pulsing relays.

1813-Q—What is still another contact on relay T, shown on Plate 13, and when is it closed?
A—Contact A5-A6, and it is closed when the brakes are released and the battery supply for relay U is carried through this contact.

1814-Q—How does relay U receive its battery supply?
A—Plate 12 had shown that the battery supply for relay U was carried from contact A6 of relay V and thence to relay U either through contact A1-A2 of switch S or through C4-C5 of relay U.

1815-Q—Why is the battery supply carried through contact A5-A6 of relay T before going to relay U?
A—Under this arrangement it is impossible to energize relay U unless the barkes are released as indicated by relay T being energized.

1816-Q—Why is this feature necessary?
A—Because the proper bridge balance and pulsing of the relays can be obtained only with the brakes released.

1817-Q—Referring back to earlier descriptions, when are the brake circuits checked?
A—By the bridge when brakes are released; by the current when applied.

1818-Q—Why is it necessary to hold relay U energized?
A—Since the indicating lights are controlled from contacts on relay U it is necessary to hold the relay energized while the brakes are applied.

1819-Q—Why is it necessary to provide another source of power to hold relay U energized?
A—Releasing relay T would open the battery supply of relay U, thus allowing it to become deenergized when the brakes are applied, therefore it is necessary to provide another source of power to hold relay U energized when the brakes are applied.

A IR engineering at work
REPORT No. 4271.10

Slugger "Pinch-hits" for Battering Ram...

SAVES $13,000...

Six men spent 21 hours removing nuts from 54 five-inch diameter bolts on this hydro-generator rebuilding job. An 800 lb. battering ram was used to remove the nuts, which held three drive shaft couplings together between water wheel and generator.

It took seven men another 24 hours to tighten the same nuts with the battering ram. Down time on the generator cost $300 per hour. The problem was how to run the nuts faster and with less manpower.

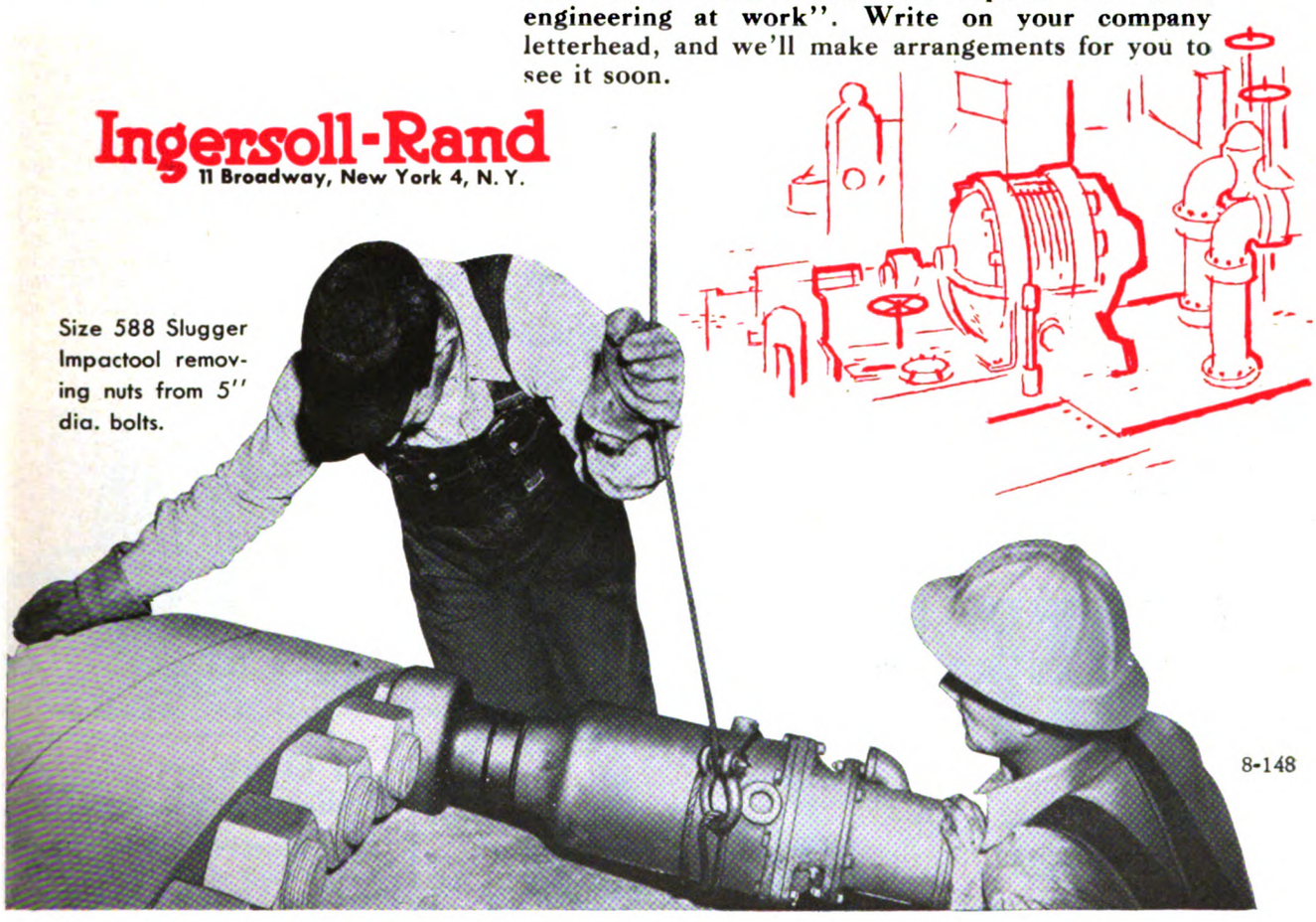
AIR engineering was put to work. A Size 588 Slugger Impactool "pinch-hit" for the battering ram. Two men then removed all the nuts in 1¾ hours, and put them on again in 2 hours, saving 286½ manhours and 41¼ hours down time. With nearly $13,000 saved on its first job, the Slugger now has a "full-time" job.

AIR engineering Manual

Over 100 interesting and helpful case history applications of AIR engineering at work.

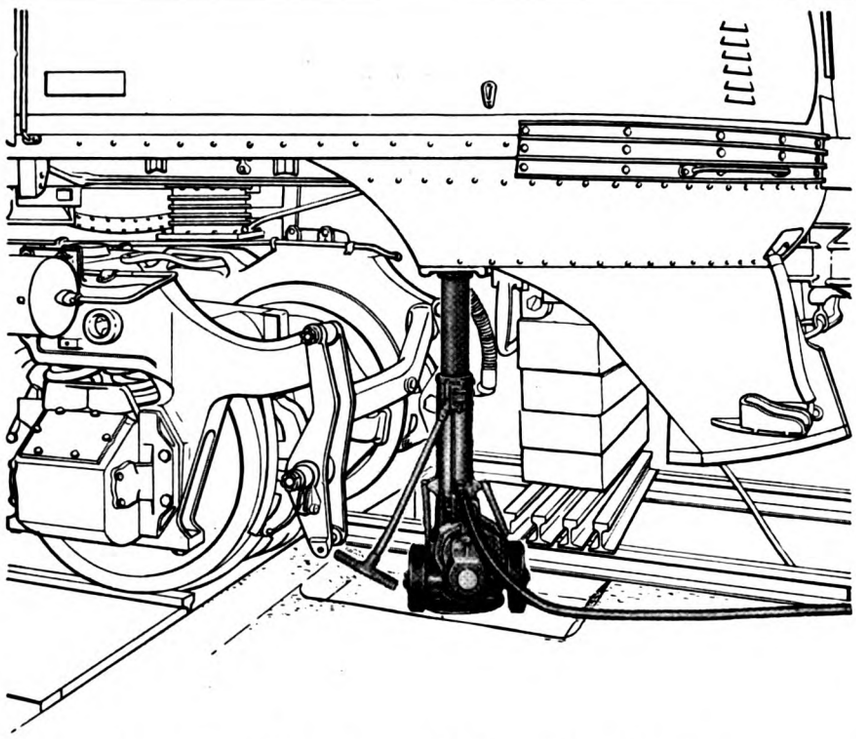
If you in any way influence production or maintenance cost-savings in your plant, it will pay you to see I-R's confidential manual of reports on "AIR engineering at work". Write on your company letterhead, and we'll make arrangements for you to see it soon.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.



Size 588 Slugger Impactool removing nuts from 5" dia. bolts.

8-148



How One Man Can Raise the Heaviest Diesel Locomotive in a Few Minutes!

Take two Duff-Norton Air Motor Power Jacks, wheel them into position under the locomotive frame, connect them with an air hose "Y," turn the valve that starts compressed air into the jacks' built-in air motors, then sit down if you wish and watch as the load goes up evenly, smoothly, safely—in a few minutes you can proceed with repairs. Locomotive trucks, for example, can be completely replaced in about 2 hours!

Tests conducted by various railroads in their own shops have shown savings in time and labor that pay for these air motor jacks in a few months.

Get the complete specifications of the various time and labor-saving Duff-Norton Air Motor Power Jacks. They vary in capacity from 20 to 100 tons. Write the world's oldest and largest manufacturer of lifting jacks for catalog AD-11G, The Duff-Norton Manufacturing Company, P. O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON

"Giving Industry A Lift Since 1883"

Jacks

EQUIPMENT

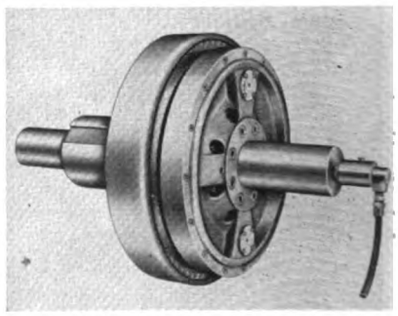
(Continued from page 16)

the extinguisher shell and a practical and functional carrying handle. The unit has the approval of the National Board of Fire Underwriters. *Ansul Chemical Company, Marinette, Wis.*

Selenium Rectifiers

Highly efficient, according to the manufacturer, these rectifiers have a power factor of 97 per cent and a d-c ripple of approximately 4 per cent. They are available in many models for industrial application including fan cooled, convection cooled, combination convection-fan cooled and water-cooled types.

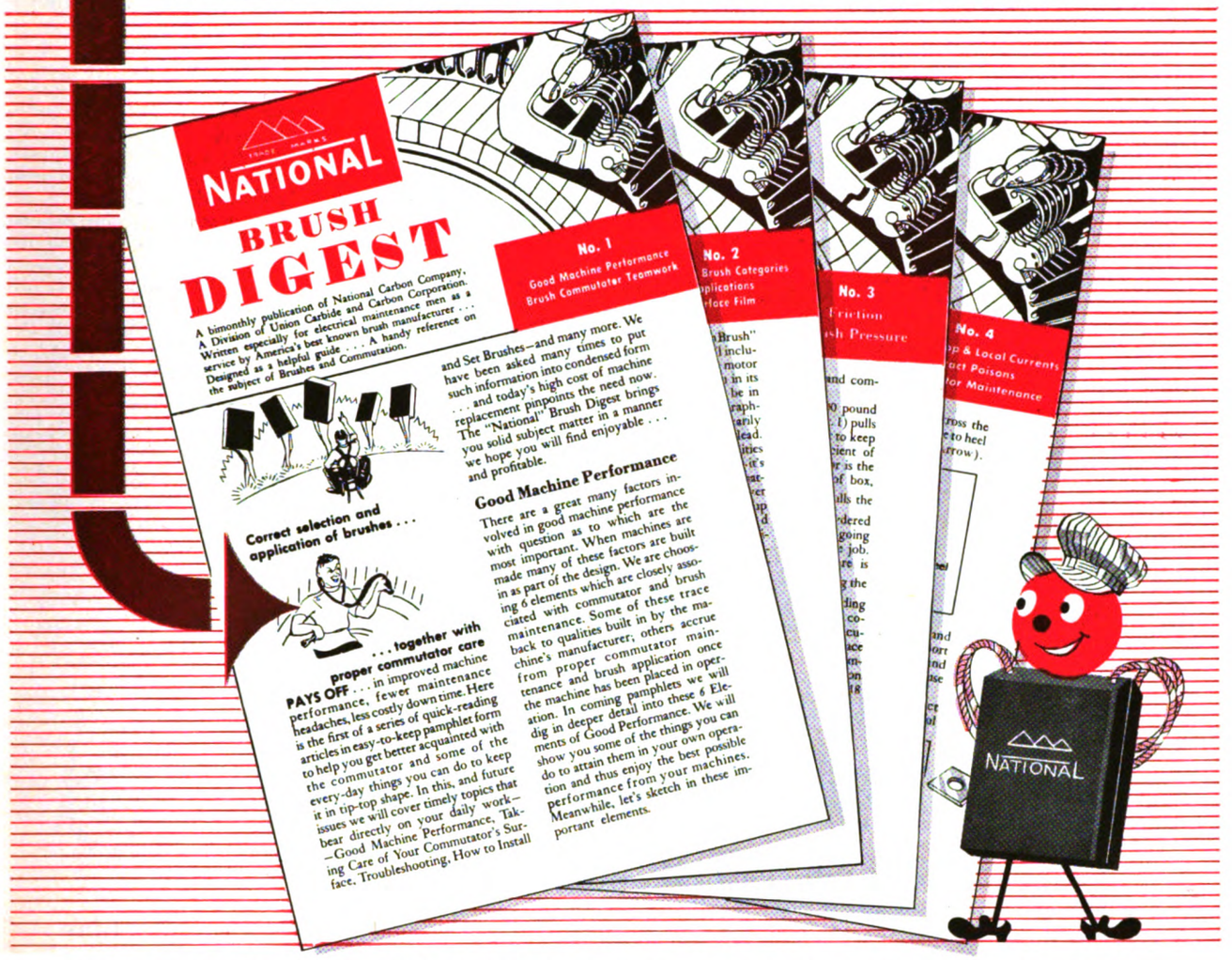
These rectifiers have been designed to give many years of service and inexpensive operation, states the manufacturer. Oversize components are used throughout. Copper bus bars operate at low current density. *The Walker Division, Norma Hoffman Bearings Corporation, Stamford, Conn.*



Air Clutch Indicating Micrometer

This device, the Air-Grip, responds instantly to a touch of the throttle because a minimum of air is used in operation. This

ORDER THIS FREE TWO-YEAR COURSE IN MOTOR AND GENERATOR MAINTENANCE



HERE'S AN INSTALLMENT COURSE in brush and commutator maintenance *especially edited for the operating man* — and it's yours with the compliments of National Carbon Company.

If you are a supervisor, write for these interesting, fully illustrated pamphlets in *quantity* . . . distribute them to electrical and mechanical departments, purchasing agents, employee training classes. Issued every other month, these four-page, pocket-size folders offer light, easy reading, yet are packed with fundamentals of commutator care and maintenance, brush selection and application, and simplified theory.

FILL IN THE BLANKS BELOW AND MAIL.

You'll get each issue thereafter in the quantity requested, including any back issues prior to your request. Treat yourself and your men to this useful "course", based on National Carbon's 70-year experience in the field.

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NAME..... **TITLE**.....

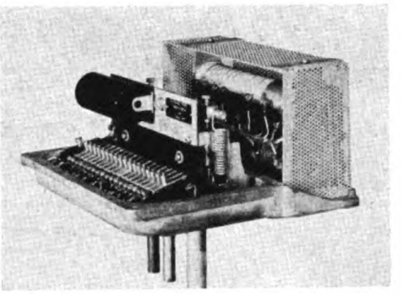
COMPANY .....

ADDRESS .....

Signed.....

sensitivity provides a finger-tip control and an ability to inch the clutch or throw it into full engagement, as required. Instant disengagement is achieved by the use of quick release valves built into the unit itself. These valves are optional equipment when fast disengagement is desired. Provision has been made for internal ventilation. The internal flexible air seal disc is so located that it does not come in contact with the heat generating plates.

Provision is also made for mechanical engagement of the clutch in case the air supply fails. It is available in single and double plate models from 8.5 to 806 hp at 100 rpm at 80 psi. *Dodge Manufacturing Corporation, Mishawaka, Ind.*



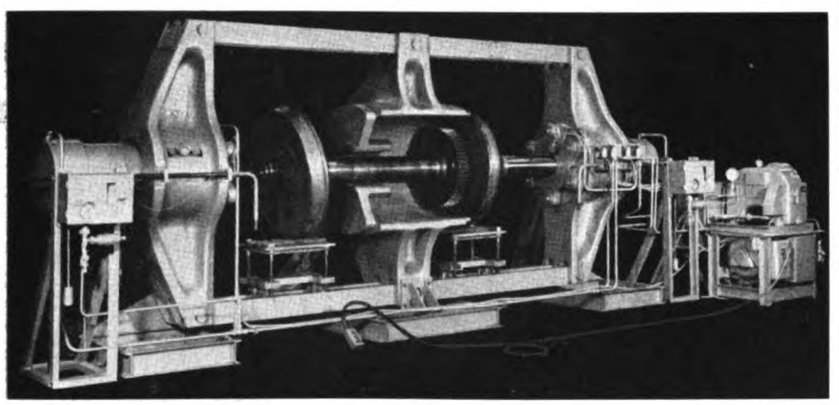
Temperature Controller

This control has been designed to provide cooling systems for diesel-electric locomotives with closer temperature regulation and greater system stability, according to the manufacturer.

The control, which is for use with clutch-driven fans, will operate in temperatures ranging from minus 40 to 120 deg F and is unaffected by sleet, freezing rain, drifting snow, sand, cinders or brakeshoe dust. It will operate at altitudes over 10,000 ft as well as in tunnels.

The device is basically a single lever moved by a thermostat. This lever operates a multi-finger rheostat in series with a clutch coil and voltage supply. Shutter air cylinders are supplied from a common air line controlled by a conventional magnet. Excitation for this valve is supplied from a tap on the clutch rheostat.

Maximum response is possible because the controller is closely tied-in with the water system. The controller eliminates fragile thermostat leads and prevents difficulties caused by low ambient temperatures. *Locomotive and Car Equipment Department, General Electric Company, 1 River Road, Schenectady 5, N. Y.*



. . . mount or dismount car wheels easily with a

Rodgers Double End Car Wheel Press

MOUNTING or dismounting car wheels without reversing the axle in the press is just one time and labor saving feature of the Rodgers 600 Ton Double End Press illustrated above. This press permits individual or simultaneous mounting of two wheels, removes wheels from axles equipped with drive gears, etc.

Rodgers Hydraulic Equipment Includes
Double End Car Wheel Press, 600 and 400 ton capacities.
Single End Car Wheel Press in three capacities:
200 ton, 10″ diameter yoke
300 ton, 14″ diameter yoke
400 & 600 ton, 18″ diameter yoke
Hydraulic Pumps: 2 and 4 cylinder
Forcing Presses: vertical, inclined, horizontal and portable.
Pinion Pullers
Write for illustrated catalog 315A

Rodgers Hydraulic Inc.
7464 Walker Street
Minneapolis 16, Minn.

Portable Pipe Machine

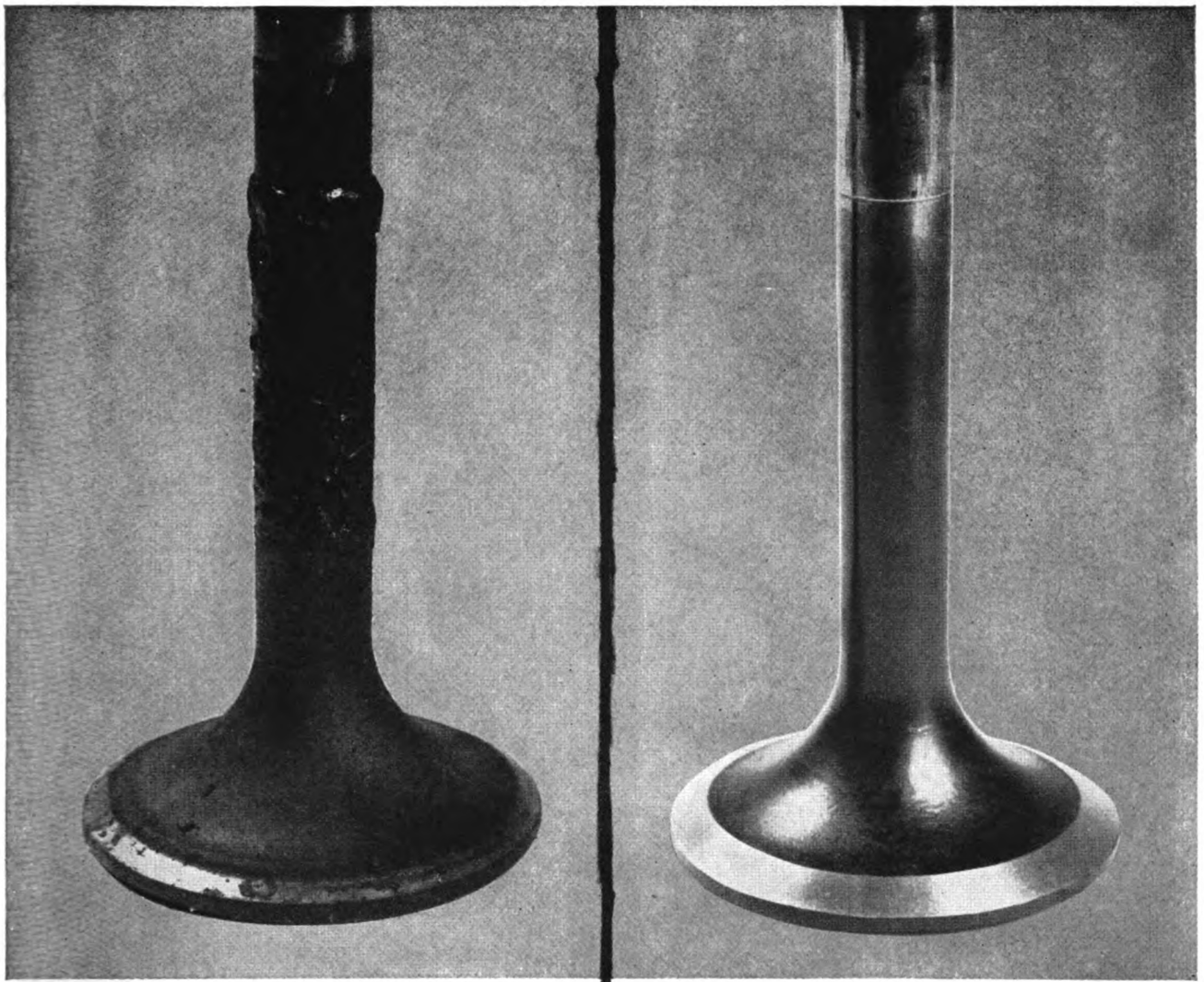
The No. 552 Pipe Master as this machine is called will ream, thread, and cut-off all sizes of pipe from ⅛ in. to 2 in. It will also drive geared die-stocks and cutters up to 12 in. through a special drive shaft.

This portable pipe and bolt threading machine weighs only 265 lb, is 39-½ in. long, 17-½ in. wide and 17-¼ in. high. It has a ½ hp universal, geared-head variable speed motor. Spindle speeds are automatically variable with load—22 to 36. The device is equipped with a floating type adjustable die-head and an adjustable front chuck. *Oster Manufacturing Company, 2057 East 61 Place, Cleveland 3.*

Electrical Filler Tape

This formulation, No 125 electrical filler tape, is an insulating compound in the form of a thick tape, wound together with a fabric-separating strip to form a roll. It is intended to replace bulk insulating fillers which require troweling, and to speed splicing operations.

Areas to be built up can be thumb-mold-



BEFORE IMMERSION IN PENNSALT MULTI-METAL CLEANER these valves are heavily coated with burnt carbon and baked on fuel deposits.

AFTER 1 HOUR IN PENNSALT MULTI-METAL CLEANER the valves are sparkling clean, ready for regrinding and reassembly.

Unretouched photographs show amazing cleaning ability of PENNSALT MULTI-METAL CLEANER

These valves are typical of thousands of vital diesel parts cleaned with Pennsalt Multi-Metal Cleaner by a leading American railroad. In this same shop tank go aluminum pistons, heads and liners; steel valves, and other precision items. Every part comes out clean, needing only a short rinse before inspection and rework.

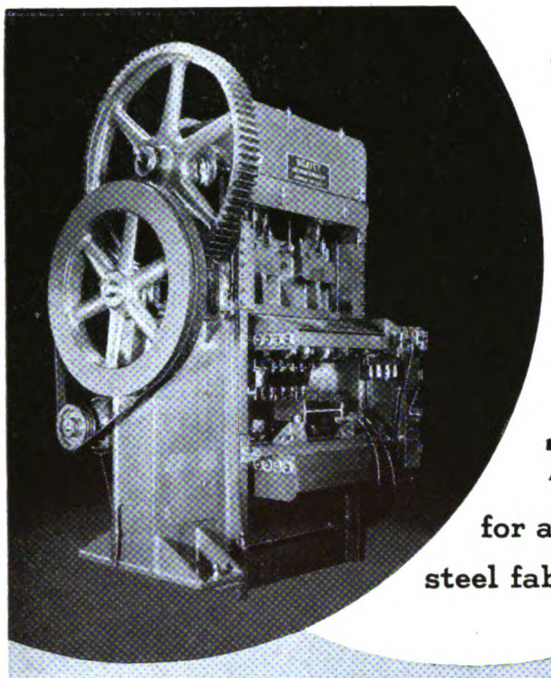
Pennsalt Multi-Metal Cleaner cuts costs, simplifies shop procedures because one cleaner does a complete job on *both* ferrous and non-ferrous parts. It cleans without attacking the base metal—will not etch even polished aluminum surfaces. It dries clean, never streaks. And it doesn't produce disagreeable fumes.

You can get more hard facts about Pennsalt Multi-Metal Cleaner from your Pennsalt Railway Maintenance Specialist. Call him now—or write us for specific information. Pennsylvania Salt Mfg. Co., Railroad Maintenance Dept., EAST: 1037 Widener Bldg., Philadelphia 7, Pa. WEST: Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, Calif.

Favorite of the men in the shops

Pennsalt Multi-Metal Cleaner is a Trade Mark of Pennsylvania Salt Mfg. Co.

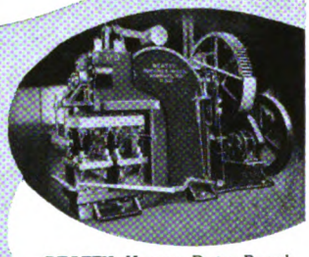
Pennsalt Chemicals



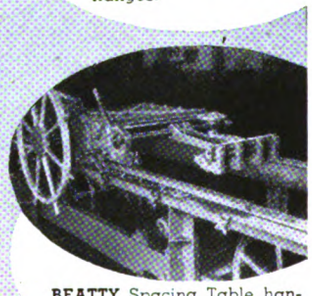
This Beatty Punch CUT COSTS 75%

for a structural steel fabricator

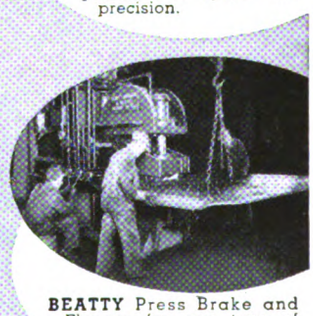
One of our present-day satisfied customers formerly employed machinery using only one punch for punching structural steel shapes. After consulting a BEATTY engineer, this firm installed a BEATTY Guillotine Beam Punch with an adjustable tooling feature that enables them to perform exact repeats of multiple punch patterns in 25% of the time formerly required. Naturally, we can't guarantee such substantial savings in every industrial installation of BEATTY machines! But, if you're currently considering additional production machinery for your metal fabricating plant, better see a BEATTY engineer before making any final decisions! Chances are he'll have an idea or two on how you can achieve greater production economies with BEATTY Machines!



BEATTY Heavy Duty Punch handles steel up to 65 ft. long. Punches webs, and flanges.

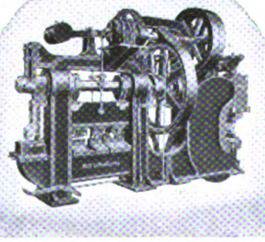


BEATTY Spacing Table handles beams, channels and plates with speed and precision.



BEATTY Press Brake and Flanger for any type of bending, forming, flanging, pressing.

BEATTY Co-Pun-Shear does coping, punching and, shearing without changing tools.



BEATTY
Machine & Mfg. Company
HAMMOND, INDIANA

ed to shape, and thicknesses pressed on at low spots with pieces torn from the roll. This tape fuses to a homogeneous mass in seconds. It is also practical for covering sharp-cornered electrical connections and for padding the edges of bus bars. It is not intended for sole insulation; the manufacturer recommends finishing with a sealer of polyethylene or vinyl tape. *Bishop Manufacturing Company, 138 Factory street, Cedar Grove, N.J.*

SUPPLY TRADE NOTES

RAILROAD FRICTION PRODUCTS CORPORATION.—The *Westinghouse Air Brake Company* and the *Johns-Manville Corporation* have formed the Railroad Friction Products Corporation to produce and market the Cobra brake shoe for locomotives and car equipment, which is being developed jointly by the two companies. The officers of the new company, which is located in Wilmerding, Pa., are *William C. Landis*, president, and *Raymond P. Townsend*, vice-president. Mr. Landis continues also as vice-president and general manager of the Air Brake Division of the Westinghouse company, and Mr. Townsend, as vice-president of the Johns-Manville Sales Corporation and manager of the Transportation Industry Department. Initially, Johns-Manville will be responsible for the commercial production of the Cobra brake shoe, while Westinghouse Air Brake will merchandise and sell the product. Further development work will be carried on by the research organizations of the two companies.

■

J. G. Mitchell

CANADIAN CAR & FOUNDRY CO.—*J. G. Mitchell*, chief engineer and production manager, Car division, has been appointed vice-president, manufacturing, railway car equipment. *G. L. McMillin* has been appointed assistant vice-president, steel foundry. Mr. McMillin was formerly works manager of General Steel Castings Corporation.

(Continued on page 95)

SUPPLY TRADE NOTES

(Continued from page 92)

Dr. F. E. Lowance

WESTINGHOUSE AIR BRAKE COMPANY.—*Dr. Franklin E. Lowance* has been appointed director of research and engineering. In this newly created position Dr. Lowance will direct and coordinate the research and engineering activities of all subsidiaries and divisions of Westinghouse Air Brake.

Dr. Lowance received his Ph.D. degree in 1935 from Duke University where his academic work was in physics and mathematics. His full-time work in research and development has been in the physics and engineering departments of Centenary College in Louisiana, Georgia Institute of Technology, and Georgia Institute where electronic and electro-mechanical projects were also under study. During World War II he served in civilian research and development work and in August 1953 was appointed associate technical director at the U.S. Naval Ordnance Test Station at China Lake, Cal.

■

E. W. Butler

SPEER CARBON COMPANY.—*Edward W. Butler* has been appointed vice-president in charge of sales. Mr. Butler was formerly vice-president of the International Telephone & Telegraph Co.

WATSON-STILLMAN

Socket-Welding Air Brake Flanges

Simplified installation and strong, tough connections are assured with Watson-Stillman Socket-Welding Air Brake Flanges. Machined from tough steel forgings, these 2-bolt oval flanges are now available in two designs—each interchangeable with other air brake flanges. The W-S One-Piece flange, now standard equipment on many railroad cars, provides a strong, leak-proof joint with maximum resistance to shock and vibration.

The recently developed 2-piece Swivel-Joint Flange was designed to facilitate bolt-hole alignment. The flange can be rotated on the insert to any position until bolt holes line up. The Swivel-Joint flange permits most of the piping to be fabricated in the shop.

Sold Through Leading Distributors

For detailed technical information on Watson-Stillman Air Brake Flanges and other Railroad Pipe Fittings send Today for Bulletin RR-1.

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

R-2

Manufacturers Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive information desired; requests will be handled direct by manufacturers.

1. WIRE ROPE SLINGS. *MacWhyte Co.* 100-page 2-color plastic-bound catalog (S-8) describes, illustrates and gives specifications for the MacWhyte line of wire rope slings and fittings; 19-page photo section shows variety of slings made and their many uses.

2. SPRAY PAINTING. *The DeVilbiss Co.* 68-page booklet (F-278) "The ABC's of Spray Equipment", in question and answer format, in non-technical language and illustrated with drawings, gives a clearer picture of spray painting.

3. VALVE & FITTINGS. *The Lunkenheimer Co.* Comprehensive, illustrated, 4-page circular (601) describes, illustrates and gives dimensions for Luncor, the first all molded PVC valve and fittings.

4. BRAZING ALLOYS. *Air Reduction Sales Co.* Aircosil Brazing Booklet gives complete information on the new and complete line of Aircosil silver brazing alloys and flux. (Aircosil brazing alloy only type sold by avoirdupois weight—16 ounces per pound.)

5. WRITE-ON TAPE. *Labelon Tape Co., Inc.* 4-color folder (#5) describes Labelon pressure sensitive plastic tape "you can write on"; pictures and discription show many uses; sample of the tape is included.

6. OVERHEAD CRANE. *Whiting Corp.* 8-page technical bulletin (Unit 79) "How To Select An Overhead Traveling Crane" is designed to help analyze handling problems, decide on type of crane desired, and draw up specification sheets for crane proposals; includes the 14 minimum crane safety features.

7. RUBBER ELECTRICAL PROPERTIES. *E. I. du Pont de Nemours & Co.* Neoprene Notebook 61 (8th in Language of Rubber series) "Electrical Properties of Rubber" includes a discussion of a new locomotive jumper featuring remountable neoprene head.

8. NICKEL CAST IRON. *International Nickel Co.* 28-page basic reference bulletin (A-69) "Guide To The Selection of Engineering Irons" presents many characteristics of modern nickel alloyed cast irons. 50 photos show typical applications; includes 27 tables and charts.

9. SPRAY WELDING. *Wall Colmonoy Corp.* 4-page 2-color illustrated bulletin (300) describes the new Model C Spraywelder (a metal powder spraying unit used in welded overlay type hardfacing applications) and the Sprayweld process.

10. GRINDING WHEELS. *Carborundum Co.* 4-page brochure (A1310) "V40 For Tool Room Grinding" describes complete new line of tool room wheels and lists hints for tool conservation; includes colorful stiff tool room chart with recommendations for grinding high speed tool and die steels.

11. BREATHER FILTERS. *Air-Maze Corp.* New folder illustrates and describes the complete line of Breather Filters both "oil-wetted" and "oil bath" types, contains over 24 engineering drawings and photographs, includes design and operating advantages.

12. PARTICLE TESTER. *North American Philips Co., Inc.* 8-page booklet (RC-135) "Norelco Portaflux—New Portable Magnetic Particle Test Unit" describes the Portaflux method for checking ferrous metal objects for surface discontinuities, with photos, drawings and diagrams describes principle of magnetic particle testing.

13. TACHOMETERS. *Metron Instrument Co.* Metron Case History Mailer #3 describes and illustrates the Metron 3-in-1 hand tachometer at work, gives reasons for product selection.

14. FLEXIBLE COUPLINGS. *Ajax Flexible Coupling Co., Inc.* Pocket size selection guide (1054) contains technical data—ratings, drawings, specifications, service factors—plus data on uses of AJAX Rubber-Bronze Bushed Flexible Couplings.

15. LUBRICATION. *Alpha Corp.* 4-page 2-color folder (103) "Fringe Area Lubrication With Molykote Lubricants" lists the various types of Molykote Molybdenum disulfide lubricant, the temperature range and application methods for each.

16. WRENCHLESS CHUCK. *Beaver Pipe Tools, Inc.* 6-page fanfold self-mailer (PG-12-54) announces, pictures and describes the new Power Grip Wrenchless Chuck, how it adapts to old machines, how Power Grip Rocker Jaws give solid grip.

17. SPUR GEAR HOIST. *Coffing Hoist Co.* 8-page 2-color bulletin (YC-YCT) describes the line of Coffing spur-gear hoists, includes photos, cut-away drawings, descriptions and specifications of the 62 different sizes and models.

Reader Service Department **FEBRUARY, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17

Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

Company .....

Address .....

City ..... **Zone** .. **State** .....

H. H. Helmbright

GENERAL ELECTRIC COMPANY. — *Henry H. Helmbright,* for many years head of the Railroad Lighting Section of the Application Engineering Department of General Electric's Lamp Division, at Nela Park, Cleveland, O., retired December 31.

Mr. Helmbright joined GE in 1919 after graduation from Case Institute of Technology. He has been involved in railway lighting since 1921, and played an important part in the introduction of sealed beam type headlighting and fluorescent lighting to the railroads. During World War II he worked on railroad blackout lighting. Mr. Helmbright is a member of the New York Railroad Club, the American Transit Association, Illuminating Engineering Society, and International Illumination Commission.

■

N. D. Bailey

EX-CELL-O CORPORATION — *Niley D. Bailey* has been appointed manager of railroad sales. Mr. Bailey, who joined Ex-Cell-O in 1941, was assigned special sales work in the Railroad Division from 1944 to 1949 when he was appointed to the home office staff of the division.

■

DUFF - NORTON MANUFACTURING COMPANY—*John J. Dixon* has succeeded *Frank H. Schwerin* as chief engineer. Mr. Dixon joined Duff-Norton in 1943 after serving in the engineering department of the Edwin L. Wiegand Company. Mr. Schwerin has retired after 36 years with Duff-Norton.

L. T. Duffy

UNION SPRING & MANUFACTURING CO.—*Leo T. Duffy* has been appointed manager of railway sales in the Chicago district, with headquarters in the Fisher building, 343 S. Dearborn street.

Mr. Duffy was previously the head of the Railway Repair & Supply Co. Prior to this he was president of Apex Railway Products for three years and vice-president of Youngstown Steel Door Company for fifteen years.

■

WORTHINGTON CORPORATION — *William A. Meiter*, central sales manager, has been appointed general sales manager, succeeding *Thomas J. Kehane* who is now vice-president in charge of sales.

■

AJAX CONSOLIDATED COMPANY — *Nicholas H. Arnold* has been elected president. Mr. Arnold was formerly sales manager of the Standard Railway Equipment Manufacturing Company.

Ajax Consolidated has taken over the manufacture and sales of the products of *Henry Giessel Company*, Chicago, which company is being liquidated.

■

JOY MANUFACTURING COMPANY — *R. G. Gehlsen* has been appointed manager, electrical connector products, with headquarters at 1201 Macklind avenue, St. Louis. *H. B. Zeppenfeld* has been appointed sales manager, Electrical Connector Division, with headquarters at St. Louis.

■

AMERICAN BRAKE SHOE COMPANY, BRAKE SHOE & CASTINGS DIVISION — *S. Whitney Dickney*, eastern district sales manager in New York, has been named assistant vice-president, with headquarters in New York.

■

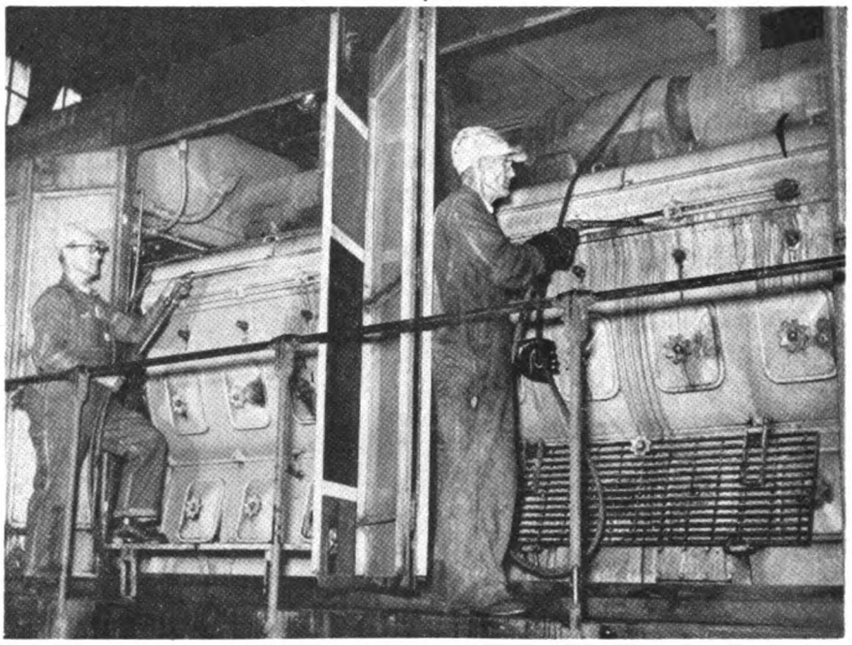
INTERNATIONAL NICKEL COMPANY. —*James B. Morey* has been placed in charge of the Cincinnati, Ohio, Technical Field Section of the Development and Research Division. *William S. Mounce* has become a member of the Constructional Alloy Steel Section of the division's staff in New York.

■

AMERICAN HOIST & DERRICK CO.—*William Niessen* and *Kenneth F. Potter* have been appointed to the positions of assistant chief engineer.

ONE Cleaner does it!

Water Rinsing ▼ Lix Cleaning ▼



Clean everything from the exhaust stack to the trucks with "LIX Engine Room Wash"!!

All except the electrical equipment can be safely and easily cleaned faster and more thoroughly than by previous methods. Records show railroads using Lix Engine Room Cleaner do complete cleaning job from stack to trucks in 3 man hours. Even the floors, engine pits and other equipment can be cleaned with "Lix Engine Room Wash."

Spray on the "Cleaner" and rinse it off with cold water, solvent or Lix Electric Equipment Cleaner. It's that simple. Removes all "Crater compound deposits from exterior surfaces without brushing or rubbing."

Lix Engine Room Cleaner is safe to use. It is non-toxic and free from fumes . . . will not harm the skin.

TEST IT . . . in your Shop

Order a drum of Lix Engine Room Wash Concentrate today. Use in accordance with our directions for 30 days and if not completely satisfied, we will cancel the invoice; or write us requesting a free Demonstration in your shop.

Write today for your **FREE** Copy of "Diesel-Electric Locomotive Maintenance."

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

THE Lix CORPORATION

PRODUCTS OF RESEARCH

716 EAST 85TH STREET
KANSAS CITY, MISSOURI

NEW CATALOG

OF HARDENED AND GROUND STEEL

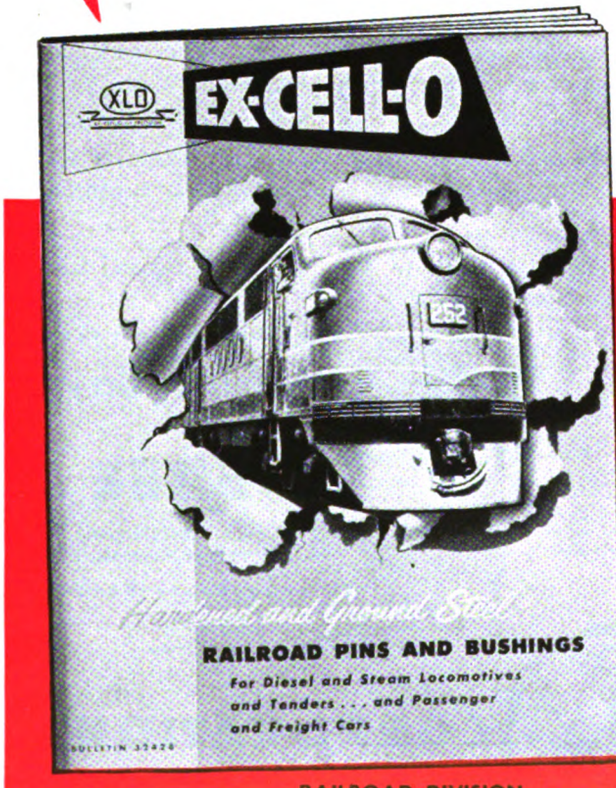
PINS AND BUSHINGS

Have within easy reach this catalog of STANDARD SIZES AND STYLES of Ex-Cell-O's long-service-life pins and bushings.

Ex-Cell-O heat treatment gives an extremely hard surface for wear resistance, a tough ductile core to withstand shocks and vibration. Over 200 railroads and equipment builders depend on Ex-Cell-O hardened and ground steel Pins and Bushings.

SEND FOR IT

Write to Ex-Cell-O for Bulletin 32559



RAILROAD DIVISION

XLO **EX-CELL-O CORPORATION**

DETROIT 32, MICHIGAN 55-4

Report from 22 Railroads:

AIR-MAZE OIL BATH AIR FILTERS PAY FOR THEMSELVES IN ONE YEAR'S TIME!

TWENTY-TWO RAILROADS have made the switch to Air-Maze oil bath filters on the air intakes of hundreds of diesels for freight, passenger or switching service. And reports indicate that savings from Air-Maze filters equal their cost in only one year!

These savings were made possible because Air-Maze oil bath air filters reduce diesel engine wear, servicing costs and turbo-charger maintenance.

Oil bath filters cut engine overhaul costs by scrubbing intake air clean in a bath of oil. Abrasive dust and dirt can't get through to wear out rings, ring grooves, and liners.

Some day all diesel locomotives will have oil bath filtration. Over 98% of all internal combustion engines in use today are protected by oil bath filters. It is a time tested and proved way of reducing maintenance costs. It is effective at all engine speeds. It is not affected by humidity or oil mist conditions. And it does not depend upon high velocity and, consequently, high pressure loss conditions for effectiveness. It reduces servicing to a few times per year.

Air-Maze oil bath filters are now available for the locomotives listed below. For further information on how they can help cut your diesel locomotive filtering costs, call on us or see your locomotive builder.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
Electromotive	800-900	Switcher	Alco-GE	2250	Rd. Switch
Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1200	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
Alco-GE	1500-1600	Rd. Switch	F-M	2400	Trainmaster
Alco-GE	1500-1600	Rd. Freight			

FREE BOOKLET: For complete information on these new developments in railroad diesel engineering, write for your free copy of the booklet, "Air-Maze Air Filters Specially Engineered For Railroads." The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio. In Canada, Masdom Corp., Montreal and Toronto; Fleck Bros., Vancouver.

AIR-MAZE **The Filter Engineers**

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

C. F. Norberg

ELECTRIC STORAGE BATTERY COMPANY.—*Carl F. Norberg* has been elected president, succeeding *S. Wyman Rolph*, who has retired after 38 years service.

Mr. Norberg joined Willard Storage Battery Company, then a subsidiary of the Electric Storage Battery Company, in 1925, shortly after he came to the United States from Sweden, where he graduated from University of Upsala and the School of Mines, Royal Institute of Technology. He held a succession of positions and was works manager and chief engineer of Willard Storage Battery Company of California until 1938 when he was transferred to the executive department of Willard in Cleveland. In 1941 he became vice-president in charge of manufacturing. He was transferred to Electric Storage Battery in 1943 and the next year became vice-president in charge of manufacturing. He was elected a director of the parent company in 1948, and in 1950 was named executive vice-president, the position he held until his election as president.

■

PRECO, INC.—Preco has acquired *Electra Motors, Inc.*, and *California Gear Company*, both of Anaheim, Cal., as another step in its expansion program. Several months ago it also acquired ownership of *Electrical Products, Inc.*, Los Angeles, manufacturers of capacitors and filters for the electronic industry.

■

K S M PRODUCTS, INC.—*Claude Batuck*, district engineer, Stud Welding Division, has been transferred from the Detroit area to Chicago territory. *Donald C. Rolling*, district engineer in the Milwaukee territory, has been transferred to the Detroit area. *F. Kern*, formerly of Denver, has been assigned the West Coast District, administering stud welding sales in California through District Steel, Inc.

■

KOPPERS COMPANY — *Frank H. Fischer*, vice-president of the Wood Preserving division of Koppers, in charge of the eastern region, has been given responsibility for special sales activities throughout the country. *Paul Wayman*, assistant manager, eastern region, has been appointed acting manager. *Douglas Grymes, Jr.*, sales manager for the division, has been promoted to executive assistant to general manager and will continue also as sales manager.

A/C Cylinders too!

Another road tested application for wear resistant PORUS-KROME*

- **Write today for detailed information on this *NEW* reclamation service.**

Address -
Dept. RL-1, VAN DER HORST CORP., OLEAN, N. Y.

***PORUS - KROME**
Good for the Life of your Engines

VAN DER HORST

TERRELL, TEXAS
OLEAN, NEW YORK
LOS ANGELES, CALIFORNIA**
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*U. S. Patents
2,048,578, 2,314,604, 2,412,698

**SparTan Engineering
West Coast Licensee

Why you cut more pipe more easily with RIDGID Heavy-Duty Pipe Cutters

Extra easy to use—beautifully balanced, you work with least effort . . . high alloy thin blade or heavy-duty cutting wheels roll right thru any pipe, almost burrless cuts . . . perfect tracking.

Extra long service—special malleable housings guaranteed not to warp or break . . . every cutter individually tested before shipment, all 6 sizes—⅛" to 6"; 4-wheel cutters to 4".

For most for your money, buy RIDGID . . . Your local Supply House stocks them for you, gets them to you fast as you need them.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID
Work-Saver Pipe Tools

RAILROAD CARS
NEW • REBUILT • REPAIRED

In America's most modern railroad shop and yard. Using BIG equipment for BIG jobs to insure efficiency and economy on all work.

WE BUY • SELL REBUILD • REMODEL REPAIR ALL R. R. & INDUSTRIAL EQUIPMENT

ALWAYS ON HAND

Ready for immediate delivery and trouble-free service.

FLAT • BOX • HOPPER
GONDOLA & TANK CARS

Good Used Repair Parts for all Cars

CABOOSE CARS
3 TYPES: ROAD • YARD • BAY WINDOW

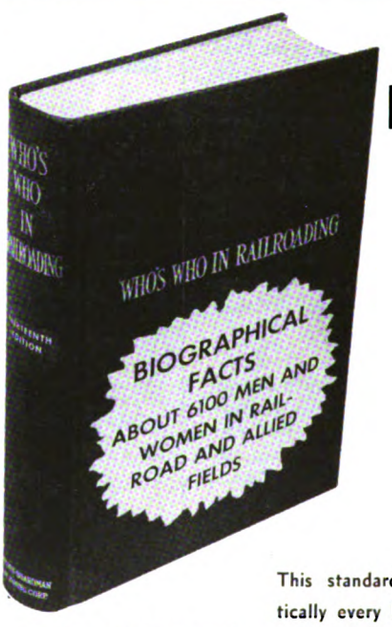
Improved Designs • Better Built • To Your Needs

COMFORT • SAFETY • ECONOMY • ALL STEEL

Cars Designed and Built to Meet Special Loading and Operating Difficulties

ENGINEERING "KNOW HOW" BACKED BY MORE THAN 38 CONTINUOUS YEARS OF EXPERIENCE.

RAIL & INDUSTRIAL EQUIPMENT CO., INC.
30 CHURCH STREET, NEW YORK 7, N. Y.



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Only Book of FACTS about Railroaders
13th Edition

This standard work includes practically every U.S. and Canadian railroader with a responsible position (plus prominent men in the supply field). It has been thoroughly revised and lists about 2,000 men who were not in the last edition. Every railroad executive or supplier needs it. Order your copy today—price only $14.00, postpaid. Money refunded in 10 days if you are not satisfied.

RAILWAY AGE BOOKS
30 Church St., New York 7, N.Y.

C. E. Impey

VAPOR HEATING CORPORATION. — *Charles E. Impey*, has been appointed executive engineer. Mr. Impey has been with Vapor for 12 years, along with three years in the Navy as a radar officer. Before coming with Vapor he was with Illinois Malleable Iron, and Majonnier Brothers in Chicago, after attending Beloit College in Wisconsin.

■

AIR REDUCTION SALES COMPANY.— *L. O. Geiger*, manager of the Dayton, Ohio, district, has retired. Mr. Geiger was with Air Reduction 38 years and supervised the sales activities in the Dayton area since 1927 when he was appointed to the post of district manager. *C. R. Grange*, assistant district manager, succeeds Mr. Geiger.

Mr. Grange became a salesman for the company in 1934 and in succeeding years was located in the Jersey City, N. J., and Philadelphia, Pa., district offices. After serving in the Navy from 1942 to 1945, he returned to Air Reduction as assistant sales manager in the St. Louis district. He has been in the Dayton district since June 1954.

■

ELASTIC STOP NUT CORPORATION OF AMERICA—*E. F. Nason*, formerly general sales manager, has been named administrative assistant; *D. E. Lally*, formerly assistant general sales manager, has been made general sales manager, and *Donald B. Sorenson*, formerly Manager of Rollpin sales, has been appointed assistant general sales manager.

■

FORMICA COMPANY.—Formica has appointed the *Met-L-Wood Corporation*, Chicago, as manufacturing and sales representative to the transportation industry.

■

LAMSON & SESSIONS CO.—*James G. Rayburn*, assistant general sales manager, has succeeded *Robert G. Patterson* as general sales manager. Mr. Patterson continues as vice-president.

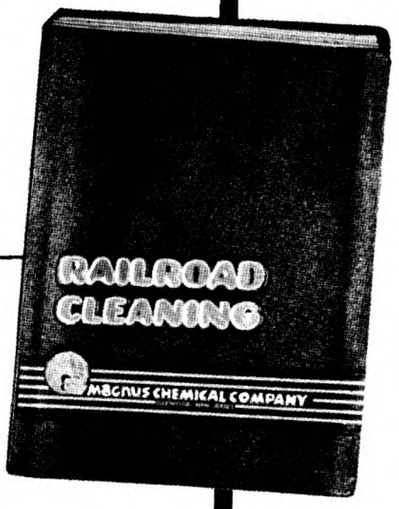
■

KERITE COMPANY.— *William A. Edwards* has been appointed assistant to vice-president *A. H. Smith*. Mr. Edwards, who joined Kerite as a Railroad department sales representative in 1946, was associated with power and light construction companies before World War II service as an 8th Air Force lieutenant (pilot).

Keep Costs Low... Efficiency High

with

MAGNUS CLEANING METHODS



In railroad operations where modernization has been adopted, Magnus Cleaning Methods have amply proved their superiority in every phase of cleaning.

On Diesel Cleaning . . .

Magnus Decarbonizing Cleaner in Magnus Aja-Dip Cleaning Machines will reduce hand labor on cleaning diesel parts by close to 85% . . . will cut the time required in half . . . and will save more than half of the cleaner costs. Magnus Diesel Magnusol for cleaning the exteriors of road engines will cut manpower and time in half . . . and will do a much better cleaning job. In diesel cabs, Magnus 5-RR will insure faster cleaning at greatly reduced cost.

On Other Cleaning Operations . . .

Magnus Cleaners and/or Machines offer you similar opportunities to cut costs and improve results . . . from cleaning A-frames or blocks, trucks and underbodies, engine pits, oily concrete areas, signal and communications equipment, to the routine jobs of cleaning linoleum and tile in washrooms, offices or stations, coach interiors, head liners, etc.

CHECK YOUR CURRENT PRACTICE AGAINST MAGNUS METHODS. ASK FOR THE MAGNUS RAILROAD CLEANING MANUAL.

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Railroad Division

MAGNUS CHEMICAL CO., INC.

77 South Ave., Garwood, N. J.

Please send us a copy of the Magnus Railroad Cleaning Manual.

NAME_____ TITLE_____

RAILROAD_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

NEW TOLEDO VISE STAND

a Sturdy Lightweight Work Bench!

BUILT-IN TRAY folds for easy carrying

Handy new Toledo No. 8 Vise Stand goes to any pipe-fitting job easily . . . sets up or takes down quickly . . . saves time and effort. All one unit, no loose parts. Extra rugged, won't fold up in use. Large size vise base for easy mounting of Toledo or other vises. 3 pipe benders, plenty of tool slots, pipe rest, ceiling brace. See it now—a great value at your supply house!

NEW TOLEDO PIPE VISE

***Exclusive* ROCKING-WEDGE ACTION JAWS**

Small Pipe from ⅛″ | **Larger Pipe to 2½″** | **Tees, Ells Valves**

Grips any shape without crushing. Jaw action tends to eliminate marking of pipe. Heat treated jaws. Capacity—No. 1 Vise, ⅛″ to 2½″. Order through your supplier.

THE TOLEDO PIPE THREADING MACHINE CO.
Toledo 4, Ohio

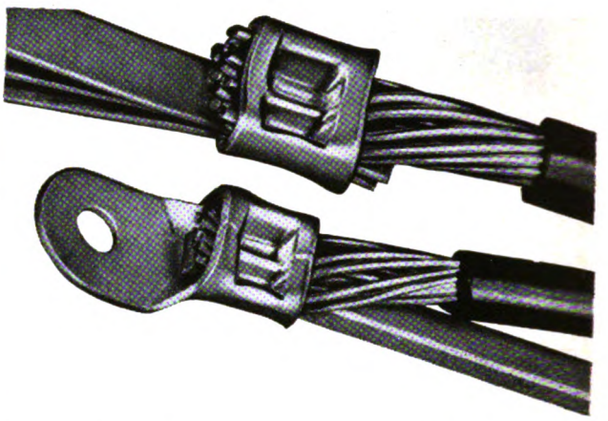
"TOLEDO"
TRADE-MARK REGISTERED U.S. PAT. OFFICE

Builders of the World's Finest Pipe Tools

PIPE THREADERS
PIPE WRENCHES
POWER PIPE MACHINES

AMP SOLISTRAND TERMINALS

NOW UP TO 600,000 CIRCULAR MILS!



AMP "SOLISTRAND" terminals, strongest and best of all non-insulated solderless connectors, are now available in wire ranges up to 600,000 circular mils! Patented AMP "W" Crimp unites all conductors into a homogeneous, corrosion resistant mass with the terminal barrel. Optimum electrical and mechanical performance is assured through AMP's pre-determined crimp formula. Short barrel lengths, brazed seam construction, and reinforced tongue, all contribute to make AMP SOLISTRAND terminals the outstanding permanent splice or connection for solid, stranded, irregular shaped, or combinations of these wire types.

AMP precision-engineered crimping tools are available for all wiring requirements. Each tool from the smallest hand tool to the powerful new DYNA-CRIMP pneumatic-hydraulic crimping unit (see below), is designed to produce uniformly high quality terminations with ease, precision, and efficiency. Write today for information and samples.

DYNAcrimp
PNEUMATIC- HYDRAULIC TOOL

New, DYNA-CRIMP tool features fast positive crimping action and easily-opened swivel head. This tool gives maximum portability with remote control operation. Interchangeable dies are available for use with AMP's complete line of terminals.

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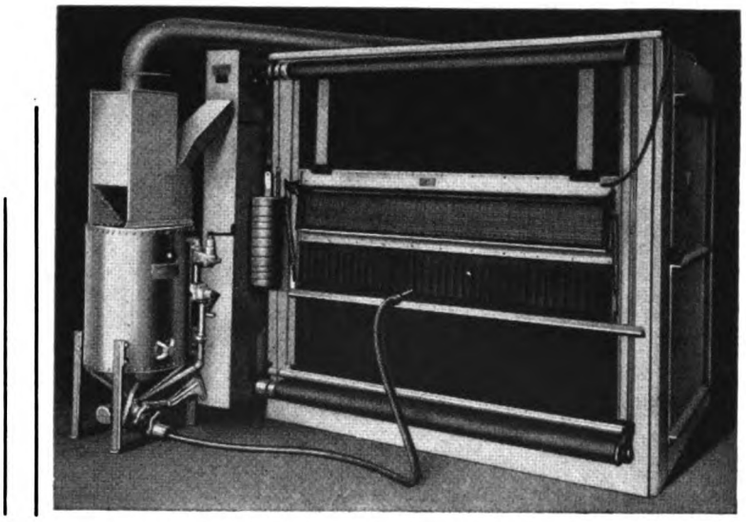
AIRCRAFT-MARINE PRODUCTS, INC.
POWER TERMINAL DIVISION
2100 Paxton Street, Harrisburg, Penna.

In Canada — AIRCRAFT-MARINE PRODUCTS, INC.
1764 Avenue Road, Toronto 12, Ontario, Canada

Harry W. Jones, Jr.

SAFETY CAR HEATING & LIGHTING CO., LIGHTING DIVISION— The Lighting Division has been formed for manufacture and marketing of Safety's line of passenger-car lighting fixtures, luggage racks and lighting equipment for stations and terminals. The division has been separated from the company's main operation at New Haven and has headquarters in a newly acquired plant at Milford, Conn. *Harry W. Jones, Jr.*, assistant sales manager, has been appointed manager of all operations of the new division.



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Clean your motor and generator armatures with a modern softgrit blast installation. This equipment quickly removes dirt and grease at lowest cost per unit. Eliminates use of solvents and resulting toxic fumes. This sanitary type room permits operator to stand outside blast compartment. Also used for effectively decarbonizing aluminum pistons. Used by leading diesel engine overhaul shops. Names on request.

Write for literature and prices.

RUEMELIN MFG. CO.

MFRS. & ENGRS. • SAND BLAST & DUST COLLECTING EQUIPMENT
3982 N. PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

Makes JOINTS LEAKPROOF!

A SOLDER SEAL TRADE TiteSeal MARK PRODUCT ®

GASKET & JOINT SEALING COMPOUND

Makes all assemblies leakproof and pressure-tight!

7 BASIC BLENDS for every sealing requirement.

Heat-proof, non-solvent, will not shrink, crack or crumble.

Ask your distributor or write us for information

RADIATOR SPECIALTY CO.
1700 Dowd Road
Charlotte, North Carolina

WIEDEKE IDEAL TUBE EXPANDERS

for rolling sleeves in diesel cylinder heads

Typical cross section of Cylinder Head showing Sleeve. Expander with short Mandrel used at upper end. Expander with long Mandrel used at lower end.

Two style Expanders are shown, other styles quoted promptly. Please supply us with full details of your requirements.

See your Dealer or write us for Bulletin.

THE GUSTAV WIEDEKE COMPANY
DAYTON 1, OHIO

THE PERFECT CLEANER

F.O.-128

(low toxicity—high flash)

for all DIESEL ELECTRICAL EQUIPMENT

FINE ORGANICS 'SAFE-TEE' SOLVENTS

F.O.-128 does away with carbon tetrachloride and all other cleaners that may be a health hazard to personnel.

F.O.-128 increases cleaning and degreasing efficiency — does away with excessive maintenance costs, motor failures and wasted man hours.

- *zero residue on drying*
- *fifteen times more safe than carbon tetrachloride*
- *will not attack insulations*
- *non-corrosive*
- *will not produce dermatitis*

These unusual characteristics of F.O.-128 makes it ideal for cleaning all types of Diesel, electrical equipment.

Check into the safety and effectiveness of F.O.-128. Write today for details.

Now being used by an ever-increasing number of railroads from coast to coast.

Also Available—
F.O.-102 and F.O.-162—Carbon Removers
F.O.-106 and F.O.-116—Emulsion Cleaners

Our representative will be glad to call upon request. Write to Dept. '3'.

FINE ORGANICS, Inc.
211 East 19th St. • New York 3, N. Y.

R. R. King

C. H. Petersen

PAXTON-MITCHELL COMPANY.—*Robert R. King*, vice-president, engineering and production, has been appointed vice-president and general manager. *Christian H. Petersen*, sales and service engineer, has been named sales and service manager.

■

NATIONAL PNEUMATIC COMPANY.—*T. Clifford Laurent* has rejoined as sales engineer for its transit and railroad devision, at New York.

■

VANADIUM CORPORATION OF AMERICA.—*Frederick F. Franklin*, assistant district manager at Cleveland, has been appointed district manager there. He succeeds *Paul H. Shaeffer*, who has retired but will continue to serve as special representative.

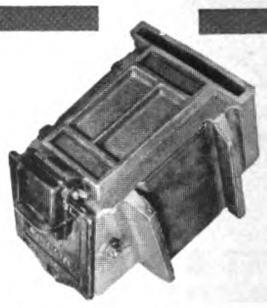
■

UNION SPRING & MANUFACTURING CO.—*Leo T. Duffy*, of the *Railway Repair & Supply Co.*, has been appointed manager of railway sales in the Chicago district for Union Spring & Manufacturing Co.

■

UNITED STATES RAILWAY EQUIPMENT COMPANY.—*Edward J. England*, has been appointed executive vice-president at Chicago.

Custom-built or standard JOURNAL BOXES by Franklin Balmar



You are assured complete quality control, from raw material to finished journal box, when you choose Franklin Balmar. Both surface-bearing and roller bearing boxes are made of electric furnace steel, cast in our own foundry—and machined to close tolerances on modern equipment by our own highly trained personnel. When you need journal boxes or other steel castings send us your inquiries.

FRANKLIN BALMAR CORPORATION

Woodberry, Baltimore 11, Maryland
Chicago Office: 5001 North Wolcott Avenue, Chicago 40, Ill.

H. M. Aitkenhead

ACF INDUSTRIES, INCORPORATED.—*Harold M. Aitkenhead* has been appointed district sales manager of the St. Louis office. Mr. Aitkenhead, formerly sales agent in the St. Louis office, will report to E. B. Carpenter, western sales manager.

■

GRAYBAR ELECTRIC COMPANY.—*G. L. Call*, branch manager at Akron, Ohio, has been appointed Cincinnati district sales manager.

■

PITTSBURGH SCREW & BOLT CO.—*John Krause, Jr.*, has been appointed assistant to general manager of sales. He was formerly assistant general manager of sales of Oliver Iron & Steel Corp.

DEARBORN CHEMICAL COMPANY.—*Roger Q. Milnes*, vice-president and sales manager, Western Railroad division, has retired. *Samuel C. Johnson*, has been appointed vice-president, Railroad Department, assuming responsibility for all railroad sales. Mr. Johnson was formerly vice-president, Eastern division, Railroad Department.

■

WYANDOTTE CHEMICAL CORPORATION.—*James S. Hubbard* and *Charles J. Martin* have been appointed sales managers of district offices at Boston and Buffalo, respectively.

Obituary

ERNEST KUEHN, 69, retired Pacific Coast regional manager of the Electro-Motive Division of General Motors Corporation, died December 8 at Indio, Cal.

WILLIAM W. VOSPER, founder of the Toledo Pipe Threading Machine Company, died December 17, at the age of 79 years.

GEORGE A. MURPHY, SR., 73, retired vice-president and consultant of Magnus Metal Corporation, died at Chicago December 16.

DUNCAN W. FRASER, 79, who retired as chairman of the board of American Locomotive Company in April 1954, died December 20 at Harkness Pavilion of Columbia Presbyterian Medical Center, New York.

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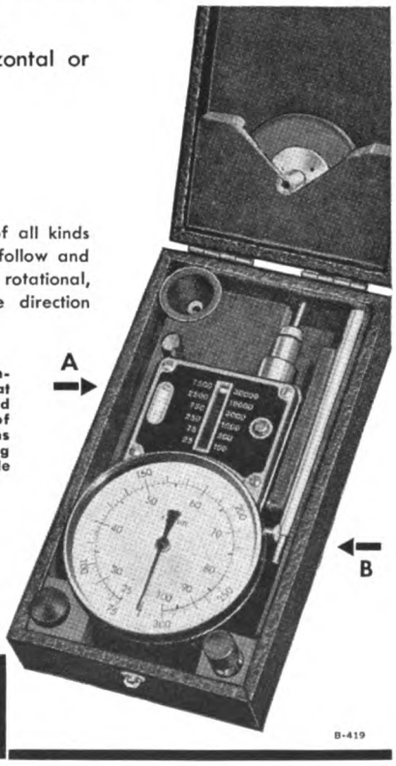

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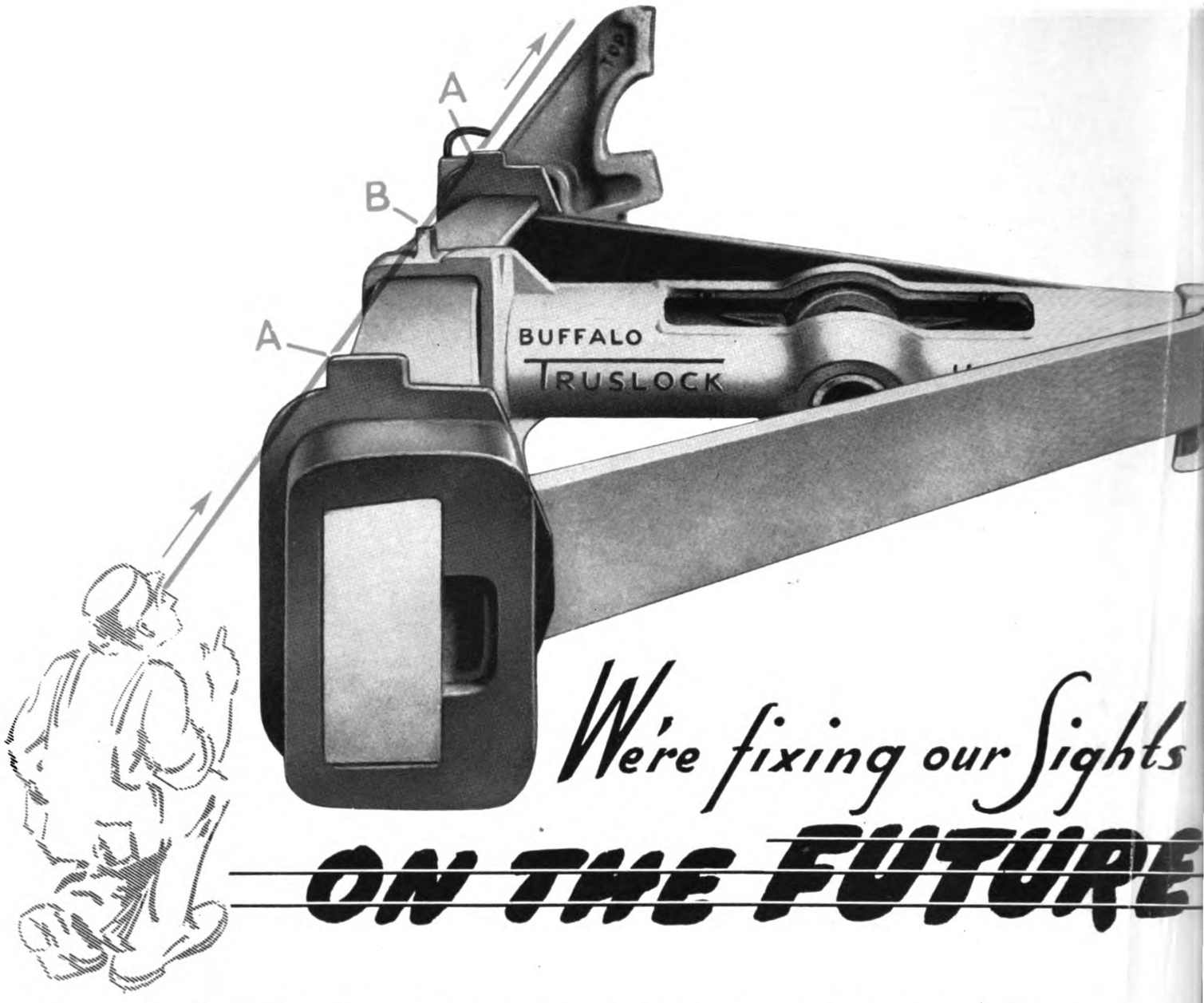

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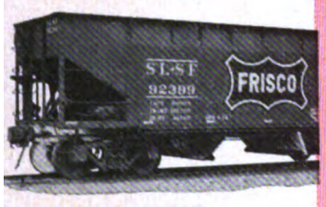
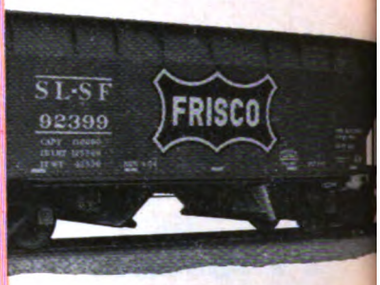
But this money is well spent—the use of Cor-Ten Steel actually pays for itself many times over. First by saving the cost of one heavy repair and second by saving the time out of service such a repair involves.





USS HIGH STRENGTH STEEL

better with USS COR-TEN Steel since 1933

The FRISCO turns to USS COR-TEN Steel to minimize freight car repair costs and to assure longer service life

THERE IS SOUND THINKING behind the use of USS COR-TEN by the St. Louis, San Francisco Railway Co.

The steadily rising cost of freight car repairs has in recent years focused attention on the economic value of construction that, by more effectively resisting damage and deterioration, will help to reduce such expenditures.

As a result, more and more railroads are adopting a *long range* point of view in their car building and rebuilding programs and are today using COR-TEN Steel construction which they know from experience will keep cars longer out of the repair shop.

Take hopper cars for example. During the normal (35 years) life of a car, body sheets of copper steel must be replaced *two* or *three* times. Under similar conditions and during the same service life, COR-TEN Steel hopper cars will require *only one* replacement of body sheets.

Railroads have estimated that the savings in repair cost thus accomplished are 5 to 6 times the extra first cost of COR-TEN Steel over copper steel. What's more, other substantial savings result from avoiding the time out of service for the additional shopping required by the copper steel car.

It is with these facts in mind that the FRISCO line has in the past five years used USS COR-TEN Steel construction in 800 new freight cars: in 200 70-ton gondolas built in 1950, and in 300 70-ton drop end gondolas and 300 55-ton hopper cars built in 1953 by Pullman Standard.

These hopper cars have been built with future costs firmly in mind. USS COR-TEN Steel is used in all sheets that contact the lading. Their dimensions are significant: $\frac{3}{8}$ in. thickness in hopper chutes and longitudinal hoods; $\frac{1}{4}$ in. side sheets; $\frac{5}{16}$ in. in floor and cross ridge sheets.

When you consider that these sheet thicknesses are equal or heavier than AAR standards and remember that USS COR-TEN Steel has 50% higher yield point than structural carbon steel, has 60% higher endurance limit and 4 to 6 times the resistance to atmospheric corrosion of plain carbon steel or 2 to 3 times that of copper steel, you will agree that longer life than usual and low repair costs can confidently be predicted for this FRISCO equipment.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—
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UNITED STATES STEEL

NEWS

Class I Roads Install 1,113 Locomotives in 1954

Class I railroads put 1,113 new locomotive units in service during 1954, compared with 2,110 in 1953, according to the Association of American Railroads. Installations last year included one steam locomotive, 15 gas turbine-electric locomotives and 1,097 diesel-electric units, while 1953 installations included 15 steam and four gas turbine-electric locomotives and 2,091 diesel-electric units.

On January 1, Class I roads had on order 483 diesel-electric units and 10 electric locomotives, compared with 546 diesel-electric units and 10 electric and 15 gas turbine-electric locomotives on order January 1, 1954.

Defects Increase Bureau of Safety Reports

The annual report of the Interstate Commerce Commission's Section of Railroad Safety, Bureau of Safety and Service, includes a recommendation that the penalty for violation of safety appliance acts be increased from $100 to $500.

The recommendation follows a report on the section's inspections of safety appliances and train brakes—investigations which showed increased percentages of defective equipment compared with the previous year. This showing, the report declares, "indicates a decrease in necessary inspection by railroads."

The report, submitted by C. W. Taylor, acting director of the bureau, advocates that "consideration should be given to recommending to Congress that the penalty for violation of safety appliance acts be increased. The present penalty of $100 for each violation was established more than 50 years ago. Taking into consideration the present-day value of the dollar, a comparable penalty would probably be $500 or more, and an increase of the penalty to that amount would no doubt cause many railroads to take more effective measures to comply with the law."

More prosecutions of safety violations also were reported, the total being 221 cases comprised of 713 counts for the year ended June 30, 1954. With 268 counts pending at the start of the year, the report states, judgment was confessed in 638 counts, four were dismissed and four, being tried, resulted in judgments for the government.

The commission itself, in its own an-

(Continued on page 22)

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE FEBRUARY ISSUE

Diesel-Electric Locomotive Orders

Road	No. of units	Horsepower	Service	Builder
Grand Trunk Western	7[1]	1,200	Road switchers	Electro-Motive
	2[1]	1,000	Switchers	American Locomotive

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Alaska	100	70-ton hopper	Greenville Steel Car
Atchison, Topeka & Santa Fe	500	50-ton box	ACF Industries
	50	70-ton refrigerator	Company shops
Central of Georgia	12	50-ton box	Pullman-Standard
Chicago & North Western	226[2]	50-ton box	Pullman-Standard
Chicago Great Western	15[4]	19,000 gal. tank	General American
	10[4]	70-ton covered hopper	Pullman-Standard
	10[4]	Caboose	International Ry. Car
Chicago Heights Terminal Transfer	100[5]	50-ton box	ACF Industries
Chicago, Milwaukee, St. Paul & Pacific	50	50-ton box	Pullman-Standard
Delaware & Hudson	100[6]	70-ton covered hopper	Pullman-Standard
Great Northern	257	70-ton gondola	Company shops
Illinois Central	100[8]	70-ton covered hopper	Pullman-Standard
Kansas City Southern	90[9]	70-ton covered hopper	Pullman-Standard
Missouri Pacific	650[10]	Box	Company shops
	50	Flat	Company shops
Pennsylvania	300[11]	70-ton covered hopper	Company shops
Rutland	50[12]	50-ton box	Pullman-Standard
St. Louis Southwestern	400[13]	Box	Pullman-Standard
Seaboard Air Line	2[14]	125-ton flat	Company shops
Southern	1,150[15]	50-ton box	Pullman-Standard
Transportation Materiel Command	202[16]	10,000 gal. tank	ACF Industries
	46	50-ton box	Pullman-Standard
Fort Dodge, Des Moines & Southern	25[17]	Rack end	Chicago Freight Car Parts

Passenger-Car Orders

Road	No. of cars	Type of car	Builder
Chicago, Burlington & Quincy	10[18]	Gallery-type	Budd Co.
Seaboard Air Line	19[19]		Pullman-Standard
	6		Budd Co.

[1] Electro-Motive units for delivery about April 1; Alco units, delivered in January.
[2] Estimated cost, $6,088.
[3] For April delivery.
[4] Delivery of hopper cars expected this month. Estimated cost, $92,000. Delivery of caboose cars to begin in April and completed in June. Estimated cost, $159,000. Estimated cost of tank cars, $175,000
[5] Estimated cost, $685,000. Delivery scheduled for April.
[6] Deliveries under way.
[7] Estimated cost, $215,000. Delivery scheduled for last quarter of this year.
[8] Estimated cost, $840,000. Delivery expected this month.
[9] Estimated unit cost, $7,600. Delivery expected within three months.
[10] 150 cars to be special "D-F" type.
[11] Delivery to be completed in late spring or early summer.
[12] Part of road's plan to budget its equipment purchases as announded in August 1954 issue, page 8, at the time it ordered 50 similar cars from the same builder.
[13] Estimated cost, $2,540,000. Deliveries expected to be completed this month.
[14] These depressed center flat cars, to cost about $32,000 each, are for special shipments, such as transformers and unusually heavy machinery. Each car will be 58 ft long with a depressed center section 21 ft long and 2 ft above the rails. The cars will have trucks with six 30-in. rolled-steel wheels. Trucks and cast-steel bodies will be manufactured by the General Steel Castings Corporation at Eddystone, Pa. Delivery expected in May.
[15] Approximate cost, $10,000,000. Cars to have Nailable Steel flooring. 200 to be equipped with roller bearings and cushion underframes. Deliveries expected to begin in second quarter of year.
[16] Tank-car unit cost, $6,400. Deliveries of tank cars to start in April and be completed in July.
[17] Delivery scheduled for fourth quarter of this year.
[18] Included in orders are cars with combinations of double bedrooms and tavern-lounges; double bedrooms, roomettes and sections; double bedrooms, compartments and drawing rooms; and 52-passenger reclining seat coaches. Among the planned innovations will be lounge roofs partially panelled in safety glass to permit overhead visibility, and smoking and reading lounges in the centers of the coaches. Deliveries scheduled for completion this year.
[19] For gypsum board loading. Car design to follow recommendations of gypsum wallboard manufacturers. End racks of all-welded construction, with a special metal enclosure at A end for adhesive materials which form part of most gypsum-board shipments. Compartment can be locked while in transit. Car decks flat and spacing of end racks such that minimum of blocking is needed. Special strap anchors positioned just inside side sill so lading may be tied with a near vertical pull to reduce side sway. Deliveries to begin late this month.

New York, New Haven & Hartford.—The New Haven is likely to have "half a dozen" new high-speed, low-center-of-gravity passenger trains in operation between New York and Boston by mid-1956. John E. Slater, chairman of the road's board fo directors, recently told the Downtown Luncheon Group of the Harvard Business School Club of New York. Trains of what he called an "improved Talgo" type, would, Mr. Slater believes, cut down New York-Boston running time from four hours or more to three hours or three hours fifteen minutes, thus shortening overall travel time from the center of one city to the center of the other by approximately one hour. This, he explained, would reduce, between city centers, the present time differential in favor of air travel, "where further appreciable time reduction is not likely"; and would retain, even after completion of contemplated new and faster express highways, the railroad's present time advantage over auto travel.

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.,
FIRM

Special oil maintains high average mileage record!

1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 354,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

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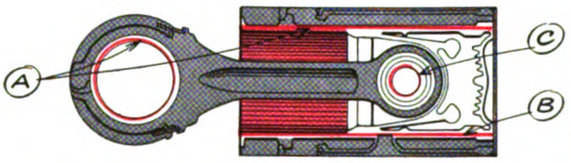

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B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

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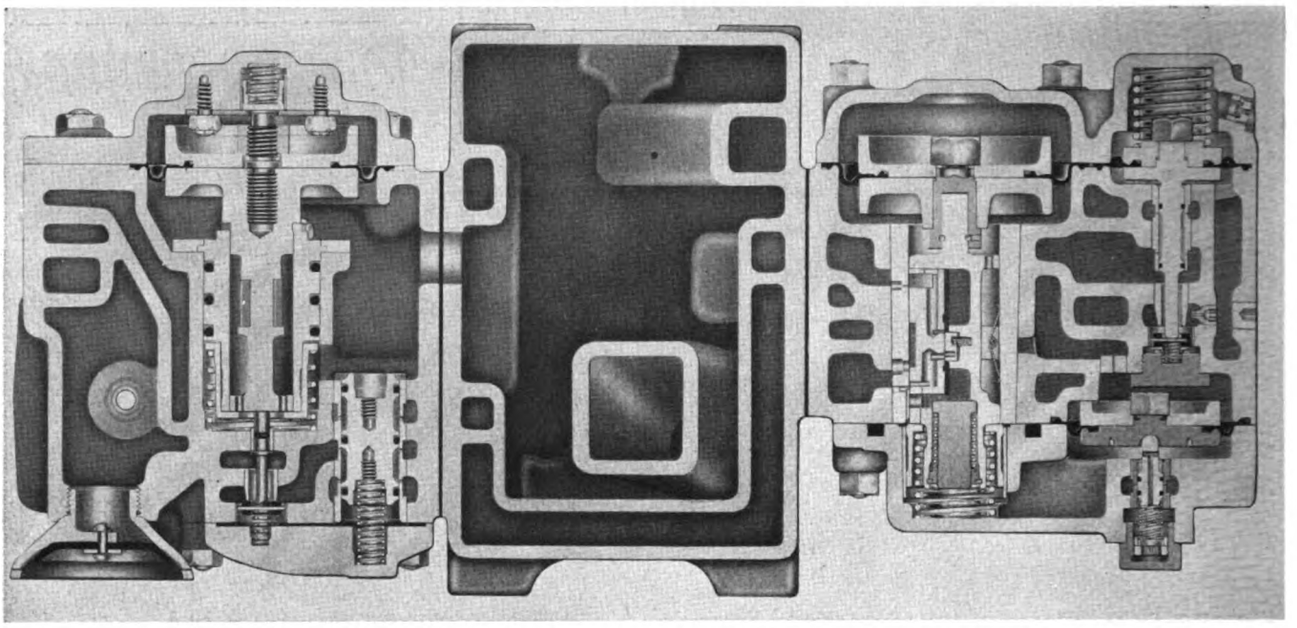
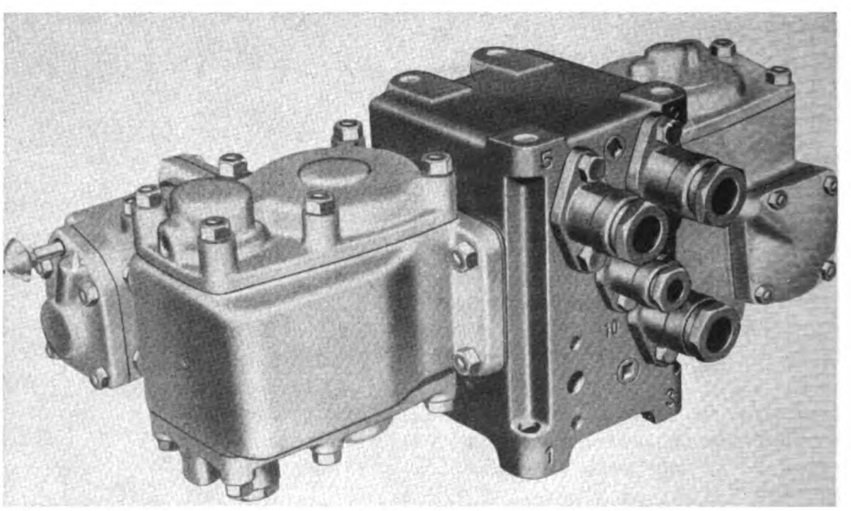


Sectional view of the AC brake valve. At the left is the emergency portion, with the diaphragm piston, slide valve and bushing (center) and the accelerated release selector valve (right). At the right is the service portion, with the service diaphragm piston, slide valve and graduating valve (left), the limiting and inshot diaphragm piston valve (upper right), and the release insuring diaphragm piston and valve (lower right)

Low Maintenance, Accelerated Release Feature . . .

Westinghouse AC Freight Brake



Westinghouse AC freight brake valve. The reapplication valve, with the service portion at the left. The manual reapplication valve button is at the extreme left

An improved air-brake control valve for freight cars which operates in complete harmony with the present standard AB brake but with removable portions approximately 40 per cent lighter in weight has been developed by the Westinghouse Air Brake Company, Air Brake Division, and placed before the AAR for its consideration. The valve, designated AC, provides positive brake operation with extremely rapid serial release action, is simpler in design, and is less costly to maintain.

The main parts of the AC valve are made of aluminum. Ring-packed pistons are replaced by diaphragm pistons. Except at two locations, slide valves are replaced by spool valves, with rubber seal rings.

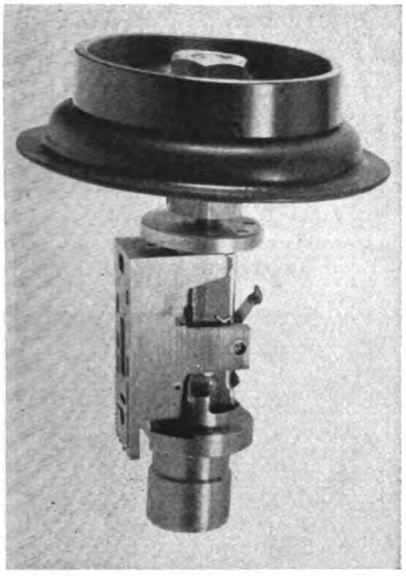
The AC brake valve performs essentially the same functions as those performed by the AB valve. The arrangement of the elements, however, has been changed and simplified. For instance, in the AB valve the in-shot piston and valve and the quick service limiting valve are separate features. These are combined in the AC valve, but a choke arrangement allows them to function at substantially the same cylinder pressure as in the AB.

The emergency section of the AB valve includes a piston, slide valve and graduating valve. In the AC valve the emergency diaphragm piston moves a small two-port slide valve and the remaining functions of the large slide valve in the AB equipment are performed by two spool valves packed with rubber seal rings.

In the AB valve the air strainer is in the pipe bracket portion. In the AC valve the brake pipe is connected directly to the vent valve in the emergency portion by a large passage, then through the strainer to other brake-pipe passages so that the air flow to the vent valve is unrestricted.

The three-stage build-up of emergency pressure, which is effected by the AB valve, has been changed to two stages in the AC valve. In the initial stage air from both auxiliary and emergency reservoirs flows to the brake cylinder by two routes. This accelerated build-up of brake-cylinder pressure is terminated when the inshot limiting function cuts off one route at 13 lb cylinder pressure. Thereafter, the build-up continues from both reservoirs through the brake-cylinder control choke at about the same rate as with the AB. The maximum cylinder pressure of 60 lb remains the same.

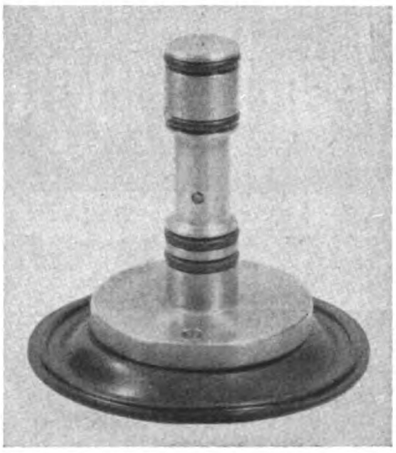
Another change which contributes to the rapid serial release of brakes after a service application is the dumping of emergency reservoir air into the brake-pipe side of the service diaphragm piston instead of into the auxiliary reservoir space



The service diaphragm piston slide valve and graduating valve

as is the case in the AB valve. This contributes to the rapid build-up of brake-pipe pressure in each car, inducing a rapid and positive movement of each service diaphragm piston and slide valve to full-release position. On a freight train of 150 cars brakes on cars at the rear end of the train begin to release 9 sec after those at the head end of the train. This compares with an interval of 50 sec on a train of the same length equipped with AB valves and requires a pressure wave traveling through the brake pipe at a speed approaching the velocity of sound. This permits release of a brake application at low speed instead of coming to a complete stop to avoid train damage, as is the present practice. The accelerated release feature does for the release function what quick service does for the application.

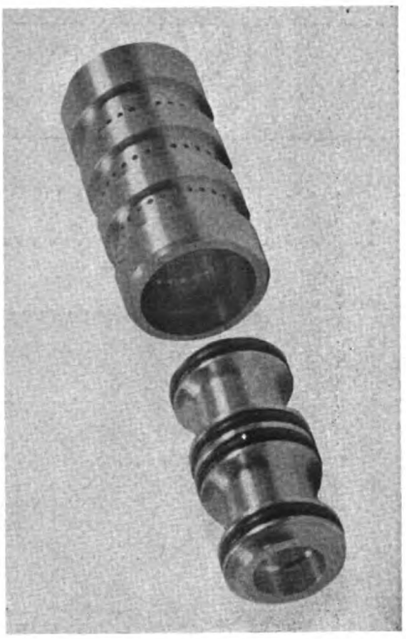
A new feature of the AC brake valve is the brake-cylinder release portion which combines two functions available in the AB valve and adds an important third



The release diaphragm piston and spool valve

function. This comprises a diaphragm-piston-operated release valve, a manually operated triplex release valve, and a manually operated reapplication valve. The triplex release valve, operated by a single handle, permits an overcharge to be released or both auxiliary and emergency reservoirs to be drained completely, or brake-cylinder pressure to be released without loss of reservoir pressure when breaking up trains. The selection between the functions is automatic, based on the presence or absence of brake-pipe pressure. By the use of the manually operated reapplication valve, in the absence of brake-pipe pressure, the brakes may be reapplied for piston travel readjustment. When brake-pipe pressure is restored following operation of the release valve, the AC valve resets automatically for proper train operation without reapplication of the brakes.

The use of diaphragm pistons instead of sliding pistons fitted with rings results in substantial maintenance savings. Piston regrooving, ring fitting and piston-chamber rebushing are completely eliminated. The diaphragms of synthetic rubber provide long piston travel and, being free from friction and leakage, are highly sensitive. The spool valves, packed with rubber "O" rings, and the bushings in



The high-pressure spool valve and bushing in the emergency portion of the valve

which they operate are subject to little wear. The relatively large emergency slide-valve bushing is ring packed and can be readily removed and replaced. The main diaphragm pistons operate vertically, which improves uniformity and stability. In addition to improvement in brake operation, these features should also permit longer intervals between required cleaning periods. Wherever controlled rates of air flow are required, replaceable chokes are employed. The size of these can be readily adapted to various sizes of brake cylinder.

The primary market for the AC valve will be for application on new freight cars. The manufacturer believes, however, that its potentially superior performance and lower cost of maintenance will make it attractive as a replacement for older AB valves as they require major overhauling. *Westinghouse Air Brake Company, Air Brake Division, Wilmerding, Pa.*

Higher-Strength Wire Rope

A new line of wire ropes, with steel cores, is said to have 15 per cent greater strength than the strongest grade marketed heretofore. Laboratory tests, as well as on-the-job observations over several years, have proved that the rope has higher resistance to wear from bending and abrasion. The rope, available primarily in preformed constructions, in sizes ranging from ¼ to 3½ in., was developed for use on shovels, draglines, wagon-scrapers, earth-moving equipment, hot-ladle cranes, etc., used in the oil, logging, mining, manufacturing and marine industries. *John A. Roebling's Sons Corporation, Trenton, N. J.*

Lightweight Magnet

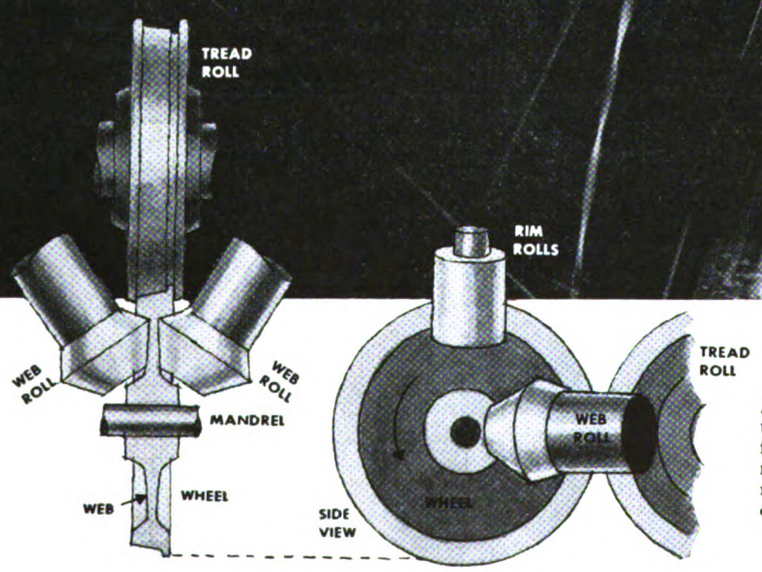
This magnet, designed for use with mobile or overhead gantry cranes, weighs only 3,400 lb as compared to approximately 3,750 lb for conventional designs. Lifting power is said to be approximately 10 per cent greater than other heavy-duty types.

It features Protecto-Weld construction wherein the outer ring and top plate are welded together on the top of the magnet. This places the weld in a position where it cannot be cracked or damaged by frequent blows. By eliminating danger of cracks, the device remains hermetically sealed against moisture indefinitely.

Lifting-coil repair or replacement is simple since the weld can be removed in a large lathe. Engineering data, such as voltages and lifting capacities for various grades of materials, are available from the manufacturer. *Ohio Electric Mfg. Co., Maple Heights, Cleveland.*

USS One-Wear Wrought Steel Wheels

start rolling here and keep rolling



AS THE WHEEL BLANK SPINS on the mandrel, two powered rolls are rotated against the web, forcing the metal out against the tread-forming roll which shapes the tread and flange. The rim rolls, rotating against the rim, form it to the correct width and thickness.

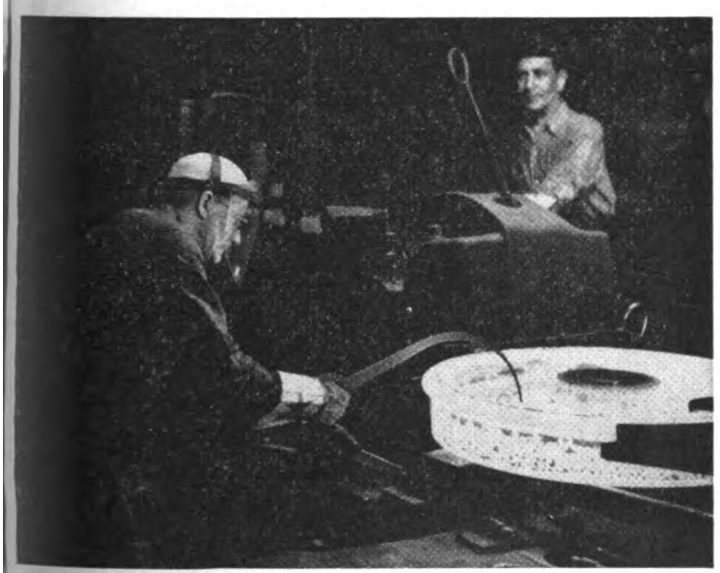
...for the FRISCO

safely for 200,000 miles or more

THIS is hot rolling—a critical step in the manufacture of USS One-Wear *Wrought* Steel Wheels.

The forged wheel blank, which has just been hub-punched and reheated, is brought from the furnace to the rolling mill by a charging machine. Giant tongs clamp onto the wheel and swing it into the rolls. As the hub lines up with the mandrel, the mandrel is shot into place. The driven rolls close on the wheel. The wheel begins to rotate. Suddenly, it's a whirling hot blur splashing pieces of hot scale through the air like a huge Fourth of July pinwheel. Perceptibly, the wheel increases in diameter as the rolls do their work. Then it slows and stops. Out goes the mandrel. The wheel, rolled to shape, is permanently identified by hot stamping—and is then on its way to the coning press, hub facing and rough boring machines, and final rigid inspection.

Controlled heating, forging, rolling and cooling produce uniformity in the structure of the steel and develop the desired hardness, ductility and strength —those qualities that make USS One-Wear *Wrought* Steel Wheels safer and more dependable than the ordinary wheel.



AFTER LEAVING the rolling mill each wheel is hot stamped with life long identification and its dimensions are checked against the required specifications with a set of king-size calipers.

USS ONE-WEAR *WROUGHT* STEEL WHEELS are your best investment because...

THEY LAST LONGER. . . USS One-Wear *Wrought* Steel Wheels will average 200,000 to 300,000 miles or more in normal freight car service.

THEY COST LESS. . . Their far greater life in any given service will reflect a *substantially lower annual cost* than that of the ordinary wheel, even though, initially, the USS One-Wear *Wrought* Steel Wheel costs a little more than the ordinary type wheel.

REQUIRE LESS MAINTENANCE.. Rolling on USS One-Wear *Wrought* Steel Wheels, a car spends more time in *service* and less time on repair sidings, resulting in increased revenue to the railroad. Also, less frequent repair means reduced maintenance and lower labor costs.

SAVE UNSPRUNG WEIGHT. . . Because they are lighter than ordinary wheels, eight *Wrought* Steel Wheels under a 50-ton capacity car will save approximately 1,520 lbs. of unsprung weight, which is directly converted either into additional payload capacity or into savings due to the decreased load. Furthermore, reduced unsprung weight means less damaging impact on the track system.

Two strategically located complete wheel shops are ready to fill your orders for *Wrought* Steel Wheels: McKees Rocks (Pittsburgh), Pennsylvania shop, serving the East and Southeast, and the Gary, Indiana shop, supplying the Western and Southern Lines.

USS WROUGHT STEEL WHEELS

UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

UNITED STATES STEEL

Frisco among first to reduce power failures through use of spliced endsills and endless V-Belt drives

Pioneering spirit of Engineering Dept. led to early acceptance of new under axle drive principle that improved power, reduced costs.

Over twenty years ago, F. G. Baker, Diesel Superintendent (now retired), St. Louis-San Francisco Railway, was seriously concerned with the common problem of generator power interruptions. These failures, depriving cars of air conditioning and light, were taking a heavy toll in costly downtime for battery recharging, maintenance and flat belt replacement. Mr. Baker took his problem to Dayton Rubber.

Out of the resulting investigations came the recommendation for a Dayton Endless V-Belt drive. Endless V-Belts were used because of their stronger gripping power, greater resistance to weather and absence of connectors.

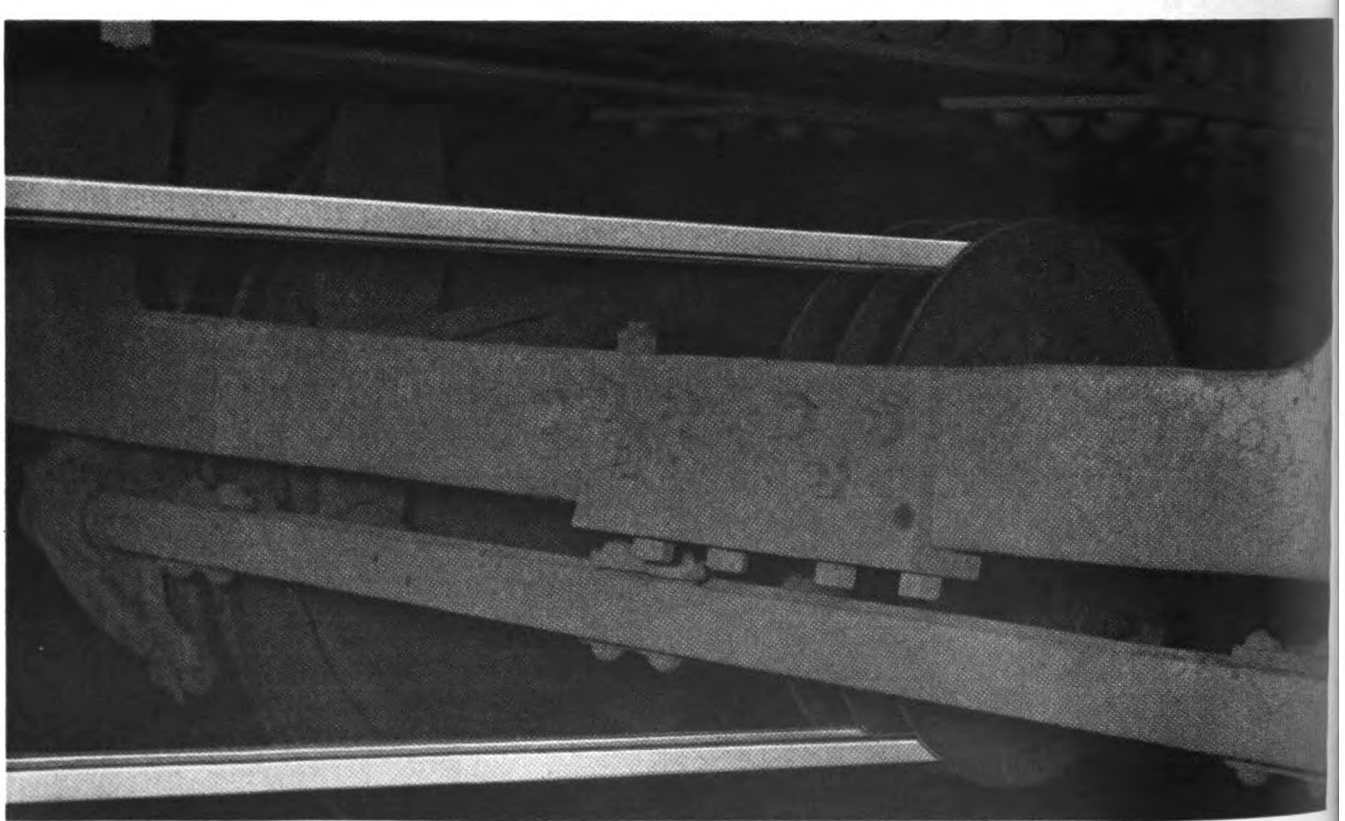
Together, engineers of Dayton Rubber Company and the St. Louis-San Francisco Railway Company worked out a spliced endsill that permitted use of Dayton *Endless* V-Belts on present equipment. Contrary to belief at that time, splicing proved to strengthen the endsill because of the reinforcing factor of the splice itself. Today, of course, Dayton's method of splicing has the approval of the foremost builders of railway trucks.

Dayton 1" BC-6 Endless V-Belts have now been made a component part and the results speak for themselves.

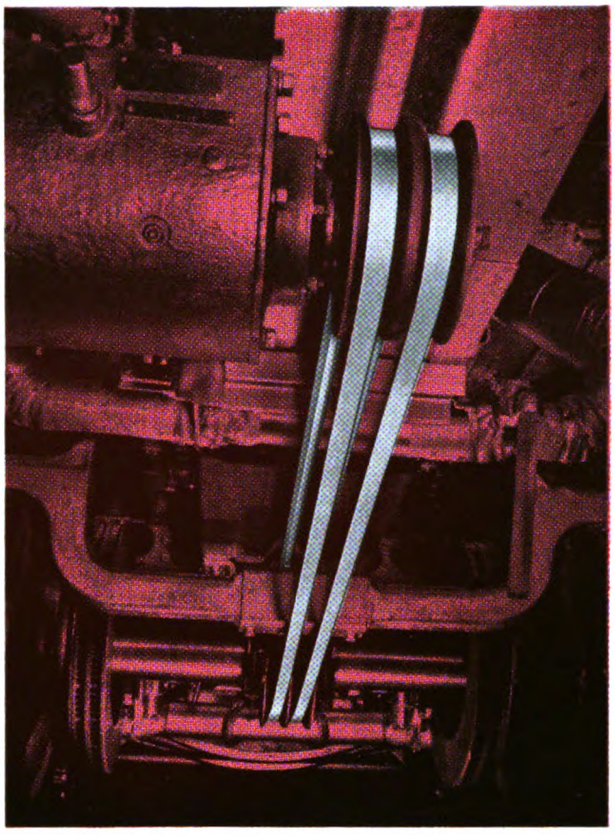
Where once 50,000 miles of uninterrupted generator service was considered excellent, Dayton Endless V-Belts were delivering 200,000 miles of continuous power. Where once drives were down for frequent belt replacement, Dayton Endless V-Belts which outlast 2 and 3 normal wheel turnings, are replaced when trucks are down for other repairs.

Since these early days, more than 17 major railroads have been using Dayton Endless V-Belts as standard equipment or have them on test pending approval as a component part.

Men of vision and foresight, like those in the engineering department of the Frisco railroad, who dedicate their lives to bettering equipment and service, are America's guarantee of ever-improving railroad transportation.



F. G. Baker, Frisco Diesel Superintendent (now retired) was an early pioneer in the use of Dayton Endless V-Belts. As early as 1934 Mr. Baker inaugurated use of the spliced endsills with these more dependable V-Belt drives.

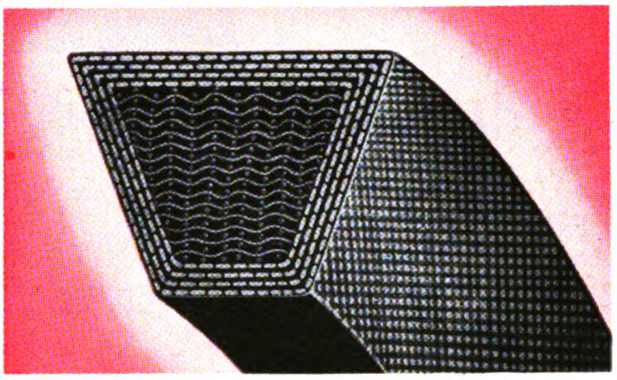


Splicing for Dayton Endless V-Belts has proved to be safe, economical, practical and efficient. In every case splice makes sill stronger.

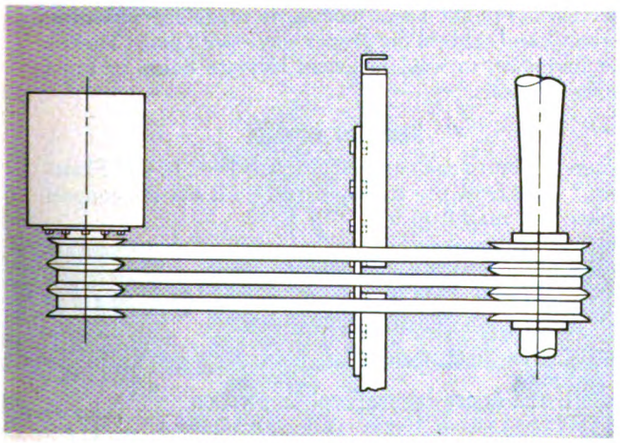
Dayton Endless V-Belt Axle Drives insure positive power.

More and more, railroad engineers are turning to Dayton Endless V-Belt drives to insure continuity of power and reduce operating costs. That's because Dayton Endless V-Belts, long a leader in the Railway field, have the built-in stamina to last and the traction quality to pull the load.

If your railroad is not receiving the many benefits to be gained from Dayton Endless V-Belt drives, it will pay you to contact your Dayton Field Engineer. He'll be glad to work with you from drawing board to yard installation and on the road. The solution to your problem may well be found through Dayton Rubber Co., Railway Div., Dept. 202, Dayton 1, Ohio.



The Dayton 1" BC-6 Endless V-Belt has provided 200,000 continuous service miles by test. Now used or on test by 17 railroads.



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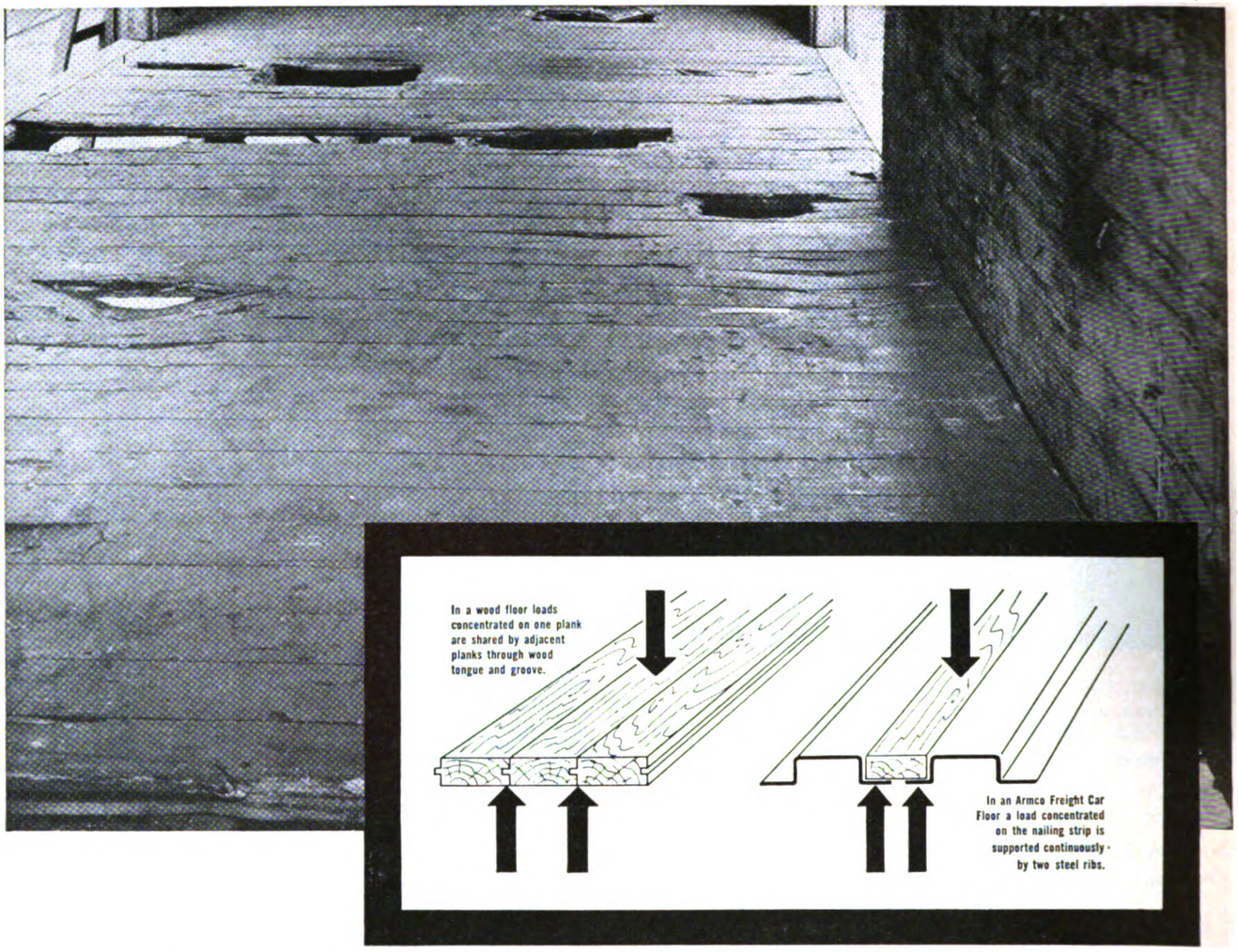
1905 · 1955 50 YEARS OF PROGRESS

Dayton Rubber

World's Largest Manufacturer of V-Belts

Specialized Railroad Representatives in New York, Chicago, Cleveland, St. Louis and San Francisco



Armco Car Flooring won't let this happen!

In Armco Freight Car Flooring, stout hat-section steel ribs take the load and support heavy wood nailing strips. That's why, even without extra stringer support, Armco Freight Car Flooring resists the heavy concentrated loads of lift trucks that often break through conventional car flooring. Besides, the ribs are welded to the car underframe and reinforce it.

For Gondola and Flat Cars, too

Armco Freight Car Flooring is made for gondola, box and flat cars. It is designed both for new construction and for replacement of worn-out wood or steel-plate floors in existing cars.

A Multi-Purpose Floor

The Armco floor will handle bulk- or unit-lading equally well. This eliminates the problem of selecting a car by floor type. It saves time and money for both the railroad and the shipper in switching empty cars. This is of special importance in the case of gondola cars. The same car that brings bulk loads into a plant can carry away the manufactured product.

Armco Freight Car Flooring is made for fastening bracing and skids in the proper way—with nails. There's no invitation to weld fasteners to plate floors or burn holes for bolts.

Send for Booklet

There's a new booklet about "Armco Freight Car Flooring." We'll send you a copy if you'll fill out the coupon below and mail it to us.

ARMCO STEEL CORPORATION
1804 Curtis Street • Middletown, Ohio

Send me a copy of the booklet, "Armco Freight Car Flooring."

Name_____

Position_____

Railroad_____

Street_____

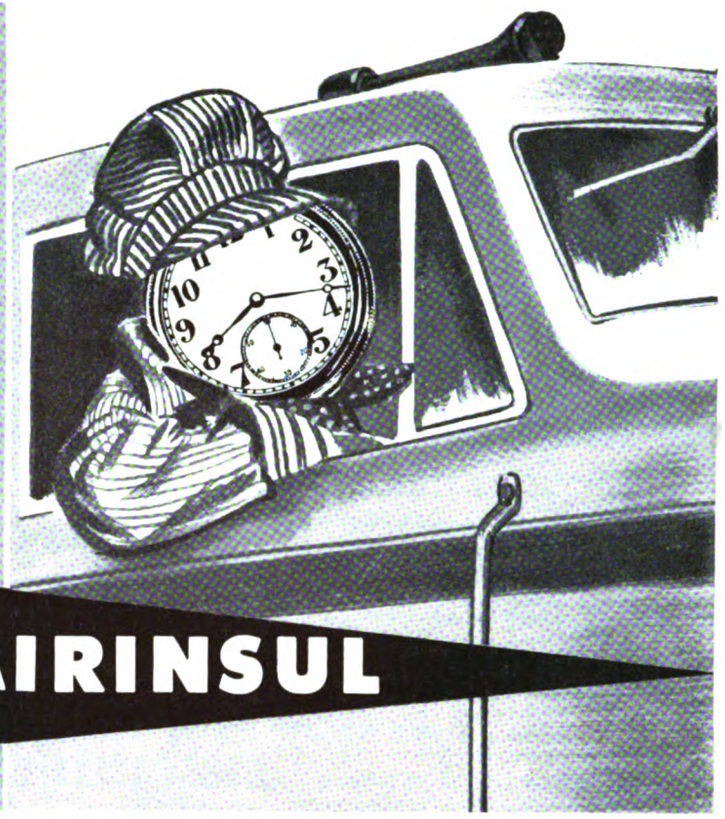
City_____ Zone____ State_____

ARMCO STEEL CORPORATION

1804 Curtis Street, Middletown, Ohio

Export: The Armco International Corporation

Time ...rides on your side with *Streamlite* HAIRINSUL



LOW CONDUCTIVITY . . . Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity —.25 btu per square foot, per hour, per degree F., per inch thick.

LIGHT WEIGHT . . . Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.

PERMANENT . . . Does not disintegrate when wet, resists absorption. Will not shake down, is fire-resistant and odorless.

EASY TO INSTALL . . . Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.

COMPLETE RANGE . . . STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings available.

HIGH SALVAGE VALUE . . . The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

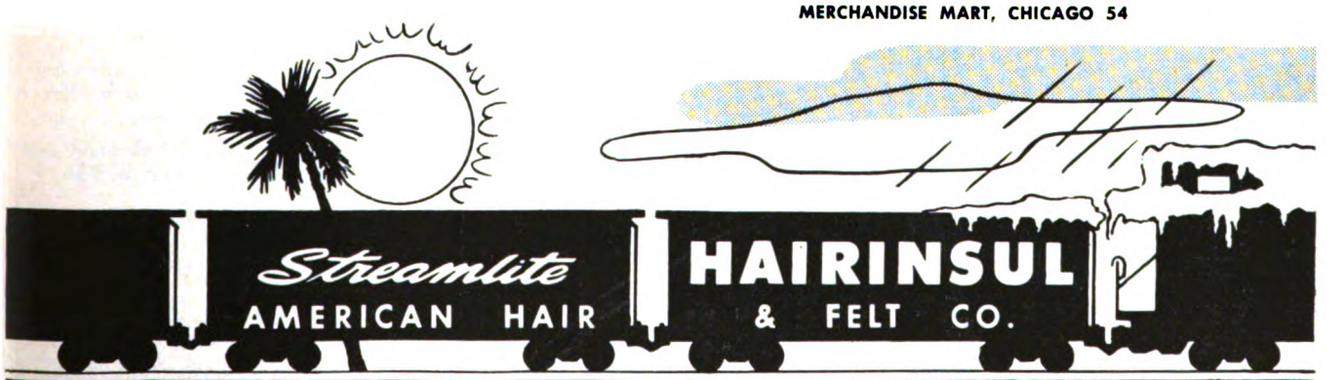
. . . because time has yet to destroy or impair the high insulating efficiency of *Streamlite* HAIRINSUL

Even after twenty or more years of service, STREAMLITE HAIRINSUL has been removed from refrigerator cars and re-used in new cars without need for further processing or renovating.

STREAMLITE HAIRINSUL, the all-hair insulation that actually weighs 40% less and gives so much more in efficiency and economy is a one-time investment.

At right are still more reasons why leading car builders demand STREAMLITE HAIRINSUL for efficient insulations. Write for complete data.

MERCHANDISE MART, CHICAGO 54



SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of November 1954	Month of November 1953	11 months ended with November 1954	11 months ended with November 1953
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,463	10,040	67,980	134,206
3-06	Total, Diesel-electric	33,284	31,328	357,117	343,881
3-07	Total, electric	652	670	7,136	7,974
3-04	Total, locomotive-miles	39,622	42,118	433,905	486,819
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,532	1,558	16,623	18,317
4-06	Empty, total	899	942	9,691	10,119
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	11,817	18,567	137,671	244,242
6-02	Total in oil-burning steam locomotive trains	1,842	4,649	24,812	64,875
6-03	Total in Diesel-electric locomotive trains	92,434	86,153	988,245	961,339
6-04	Total in electric locomotive trains	1,998	1,930	21,919	22,700
6-06	Total in all trains	108,844	111,561	1,178,306	1,295,668
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.03	1.02	1.03
10-02	Loaded freight car-miles	41.40	39.90	41.00	40.80
10-03	Empty freight car-miles	24.30	24.10	23.90	22.50
10-04	Total freight car-miles (excluding caboose)	65.70	64.00	64.90	63.30
10-05	Gross ton-miles (excluding locomotive and tender)	2,941	2,855	2,908	2,884
10-06	Net ton-miles	1,311	1,274	1,290	1,311
12	Net ton-miles per loaded car mile (M-211)	31.70	31.90	31.40	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	63.00	62.30	63.20	64.40
14	Averages per train hour (M-211):				
14-01	Train miles	18.70	18.60	18.70	18.20
14-02	Gross ton-miles (excluding locomotive and tender)	54,322	52,499	53,887	51,827
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	44.40	44.70	42.70	45.80
14-02	All	41.60	42.60	40.30	43.60
15	Average net ton-miles per freight car-day (M-240)	830	847	799	903
17	Per cent of home cars of total freight cars on the line (M-240)	50.90	48.90	53.00	46.30

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,699	2,864	24,543	45,285
3-06	Diesel-electric	20,192	20,064	229,088	221,885
3-07	Electric	1,326	1,428	15,182	16,707
3-04	Total	23,218	24,357	268,816	283,877
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	232,231	243,684	2,697,473	2,864,315
4-09	Total in coal-burning steam locomotive trains	8,171	14,707	120,273	250,711
4-10	Total in oil-burning steam locomotive trains	6,019	10,238	91,914	157,658
4-11	Total in Diesel-electric locomotive trains	203,212	202,727	2,317,145	2,270,366
12	Total car-miles per train-miles	9.62	9.63	9.66	9.76

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	268	481	3,364	6,461
1-02	Steam, oil-burning	52	70	597	1,138
1-03	Diesel-electric[1]	3,355	3,384	36,169	37,888
1-06	Total	3,683	3,953	40,225	45,703
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	10	16	129	218
2-02	Steam, oil-burning	5	4	57	70
2-03	Diesel-electric[1]	246	252	2,787	2,813
2-06	Total	287	303	3,256	3,451
3	Hours per yard locomotive-day:				
3-01	Steam	4.90	6.20	4.80	6.80
3-02	Diesel-electric	15.20	15.80	15.00	16.20
3-05	Serviceable	14.90	14.60	14.40	14.90
3-06	All locomotives (serviceable, unserviceable and stored)	12.80	13.00	12.40	13.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.68	1.76	1.68	1.73
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.76	.77	.75	.76

[1]Excludes B and trailing A units.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes: System	Foreign	Total	Miles car set off
November, 1951	2,939,503	2,022	4,405	6,427	457,368
November, 1952	2,984,101	2,198	4,501	6,699	445,455
1953					
January	2,828,906	2,219	4,123	6,342	446,059
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232

(*Continued from Page 6*)

nual report to congress, made no recommendation such as suggested by Mr. Taylor.

The safety section reported that its inspections revealed 50.85 safety defects for each 1,000 locomotives and cars inspected, as contrasted with 43.21 per 1,000 in 1953. The number of locomotives and cars inspected was 1,405,793, with 4.34% defective. A total of 1,347,710 freight cars, 42,342 passenger-train cars, and 15,741 locomotives were inspected, as against 1,253,590 freight cars, 38,115 passenger-train cars and 14,303 locomotives in the previous fiscal year.

More Defects—The total percentage of defective freight cars last year was 4.38 compared with 3.68 in 1953; of the passenger train cars and locomotives inspected last year 3.69% and 2.26% were defective, respectively, as against corresponding figures of 3.41% and 1.97% for 1953.

In the section's inspections of train brakes, the report states, 2,978 trains consisting of 138,302 cars were tested prior to departure from terminals and 99% of the cars were found operative. Tests were made on 1,684 trains arriving at terminals with 98.2% of the 98,005 cars tested found to be operative.

However, the report continues, "to procure the percentage of operative brakes (on departing trains) . . . 3,557 cars having defective brakes were set out and brakes were repaired on 4,865 cars remaining in trains. These trains had been prepared for departure, yet when . . . tested by our inspectors . . . an average of 2.8 cars per train" had to be set out or repaired.

PERSONAL MENTION

Atchinson, Topeka & Santa Fe

CREED R. BRUNELLE, assistant supervisor air brakes, Eastern District of Eastern lines at Shopton, Iowa, has retired.

J. G. HYNES, assistant supervisor of air brakes at Albuquerque, N. M., transferred to Shopton, Iowa, to succeed Mr. Brunelle.

CURT LAWHON, road foreman of engines, Eastern Division, at Argentine, Kan., appointed assistant supervisor of air brakes at Albuquerque, N. M.

PALMER A. QUARLES, assistant supervisor of air brakes, transferred from Newton, Kan., to Amarillo, Tex.

W. D. CURTIS appointed assistant supervisor of air barkes at Newton, Kan.

Atlantic Coast Line

R. M. VANN appointed diesel foreman at Jacksonville, Fla.

W. B. BENNETT appointed road foreman of engines at Waycross, Ga.

H. W. LOW, appointed road foreman of engines at Manchester, Ga.

C. D. Allen

F. E. Molloy

H. A. Hudson

F. E. Russell

Canadian National

COLIN T. CAMERON, superintendent of the car shop at Transcona, appointed assistant general superintendent, car equipment, Western region, with headquarters in Winnipeg, Man.

P. L. MATHEWSON, chief of research, appointed assistant chief of motive power and car equipment, system.

WILLIAM P. MOFFAT appointed chief of research.

Chesapeake & Ohio

C. D. ALLEN, superintendent motive power, Southern Region, at Richmond, Va., has had jurisdiction extended to include entire system. The picture of C. D. Allen that appeared on page 24 of the February issue was not that of Mr. Allen of the C&O; his picture appears above.

New York Central

GEORGE M. SCHMIDBAUER appointed assistant superintendent shop—car at Beech Grove, Ind.

J. W. STECK, superintendent of shops at Avis, Pa., has retired.

T. C. SMITH, steel shop foreman at Avis, Pa., has been placed in charge of the Avis shops.

Norfolk & Western

Headquarters, Williamson, W. Va.

C. E. IRESON, electrical foreman, has retired.

C. F. CORMELL, assistant electrical foreman at Portsmouth, Ohio, appointed electrical foreman at Williamson.

G. A. MINNIX, electrical inspector in office of general superintendent motive power, appointed assistant electrical foreman.

R. W. SMILEY, assistant road foreman of engines, Radford division, has retired.

C. B. CONNER, assistant road foreman of engines, Shenandoah division, transferred to Radford division as assistant road foreman of engines.

Southern

CAREY H. BRAZELLE appointed night foreman at Greenville, S. C.

GLEN GOLDSTON appointed road foreman of engines at Birmingham, Ala.

HALBERT A. HUDSON, signal and electrical superintendent at Cincinnati, appointed assistant to vice-president, with jurisdiction over signal and electrical affairs, at Washington, D. C.

LEONARD C. BROWN, assistant engineer, signal and electrical department, at Washington, D. C., appointed signal and electrical superintendent at Cincinnati.

Southern Pacific

FRANK E. MOLLOY appointed superintendent motive power and equipment at Sacramento, Cal., as announced in the February issue. *Born*: Creaston, Iowa, November 19,1898. *Education*: High school (nights); I.C.S. air-brake equipment courses; LaSalle courses in business management. Career: From 1913 to 1925, call boy, machinist apprentice, and special apprentice (air brake) on Chicago, Milwaukee, St. Paul Pacific; machinist on Great Northern; machinist and relief roundhouse foreman on Milwaukee. Subsequent career with SP, consecutively, as machinist, air-brake supervisor, roundhouse foreman, and master mechanic. Appointed assistant superintendent motive power in 1944; superintendent motive power (temporary) in 1951, and assistant superintendent motive power in 1952.

WILLIAM O. BROWN, master mechanic, Portland Division, appointed assistant superintendent motive power at Sacramento, Cal.

F. R. OLDS, assistant master mechanic, Portland Division, appointed master mechanic, Portland Division.

E. F. PETERS, general foreman at Eugene, Ore., appointed assistant master mechanic, Portland Division.

HERBERT G. VANCE, superintendent of shops at Sacramento, has retired.

GLEN M. CAGLEY, master mechanic, Salt Lake Division, appointed superintendent of shops at Sacramento, Cal.

ROY D. YOUNG, master car repairer, Sacramento Division, has retired.

JOHN C. STOCKTON, master car repairer, Portland Division, appointed master car repairer, Sacramento Division.

FRANCIS W. THOMPSON, appointed master car repairer, Portland Division. Mr. Thompson formerly master car repairer, Northwestern Pacific at Tiburon, Cal.

ALLEN E. SIMKINS, district car inspector at Sacramento general shops, appointed assistant master car repairer, Western Division.

Texas & New Orleans Lines

FRANK E. RUSSELL, appointed superintendent of motive power and equipment at Houston, Tex., as announced in the February issue. *Born:* Alameda, Cal., September 18, 1905. Education: University of California (B. S. in M. E. 1928). *Career*: Began in 1928 as a special apprentice on the S. P. at Sacramento, Cal., and Roseville. Subsequently was night roundhouse foreman at Crescent Lake, Ore., shop foreman at Eugene, Ore; shop foreman at Roseville; assistant master mechanic; master mechanic at El Paso, Tex., and assistant superintendent motive power at Los Angeles. until 1942. After his four year's service in the Army of the United States during World War II, with the rank of colonel, he returned to the SP on March 1, 1946, as superintendent motive power at Sacramento. During the year April 1951-52 he was on leave, serving as chief of roadway, Equipment and Manpower Branch, Railroad Transport Division, D. T. A. Washington, and vice-chairman, O. D. M. Transportation Committee for Scrap Recovery.

Western Pacific

E. T. CUYLER, has been appointed chief mechanical officer at Sacramento, Cal., as announced in the December issue. Education: Iowa University (engineering). Career: Began as a special apprentice on the Chicago, Rock Island & Pacific. Was serv-

(Continued on page 139)

You're looking at some of the nickel silver hardware for Canadian Pacific Railway's new streamliners. It was produced by the Robert Mitchell Company, Ltd., in their factory and foundry at St. Laurent, P.Q., Canada.

From door handles to ashtrays... this railroad buys Nickel Silver Hardware for Beauty and Utility at Low Cost

A representative of Canadian Pacific Railway's purchasing department is shown above, tabulating nickel silver hardware data.

Hinges, door handles, ashtrays and other decorative hardware for the new streamlined stainless steel cars are of nickel silver containing a minimum of 19% nickel, to assure enduring whiteness.

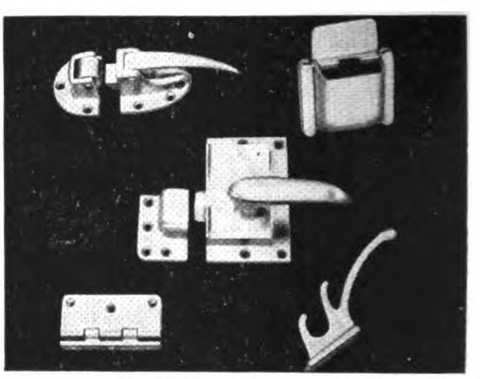
This alloy combines ornamental lustre with ability to resist corrosion and damage from wear, abrasion or scuffing. In fact, you'll find that nickel silver hardware and trim give a refined beauty to passenger car luxury throughout the life of the car. And they also minimize maintenance labor and expense the year 'round.

Moreover, nickel silver is much more easily cast than other white metals that compete with it for applications involving appearance, strength and durability.

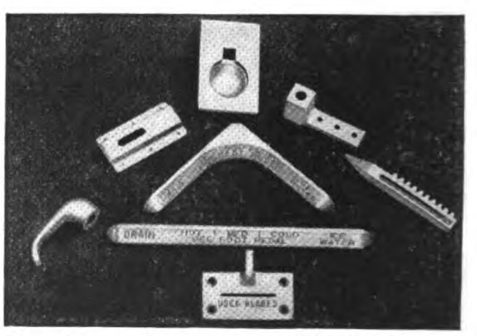
Silvery white all the way through, nickel silver answers the railroad operator's demand for impressive beauty and durability with ultimate economy.

We shall be glad to give you additional information about versatile nickel silver and help you select the alloy best suited to your requirements. Write us today for your free copy of the booklet, "Nickel Silver Castings."

INCO TRADE MARK

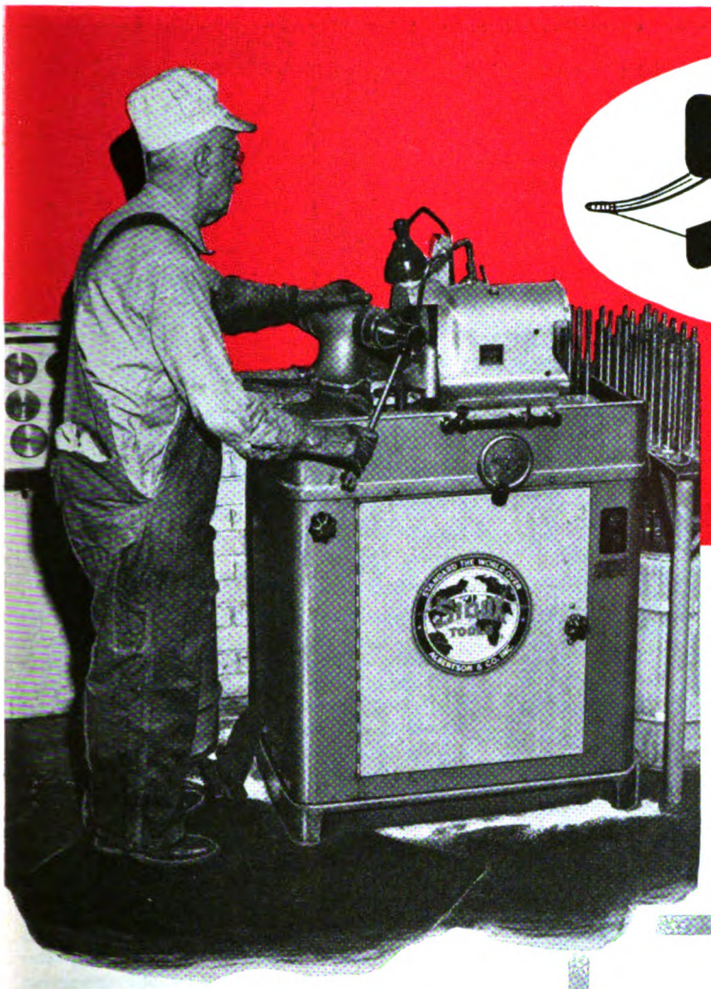


Railroad car fixtures produced in nickel silver by Loeffelholz Co., Milwaukee, Wisc., for long lasting beauty and corrosion-resistance.



Sleeping car hardware cast in nickel silver by Universal Castings Corp., Chicago, Ill. These items show the adaptability of this alloy to parts that are useful as well as ornamental.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.



SIOUX

Salutes The

FRISCO

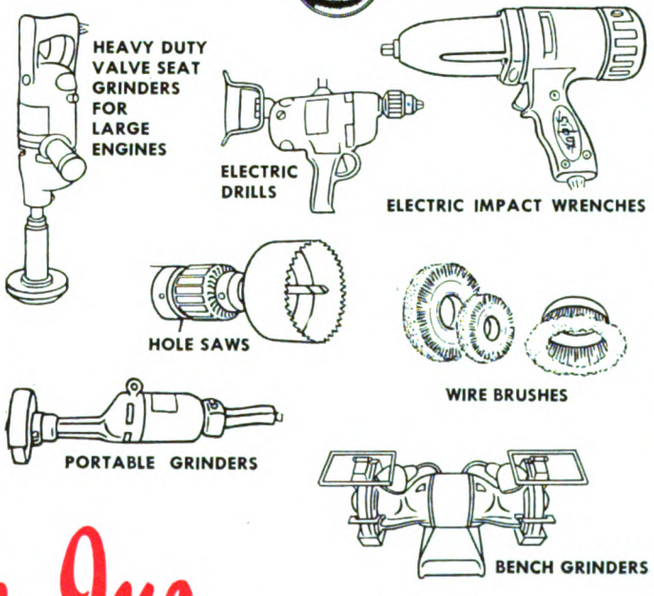
Outstanding efficiency has earned the FRISCO's Mechanical Department numerous distinctions. Albertson & Company, Inc., is proud of the part SIOUX equipment has played.

A SIOUX No. 682 Valve Grinding Machine is shown grinding valves in head reclamation operations for Alco and E-MD locomotives. This picture was taken in the FRISCO Diesel Shop at Springfield, Missouri.

When it comes to these big jobs, there's just nothing like the SIOUX No. 682 Valve Grinding Machine for precision, speed and dependability.

Sioux Tools

STANDARD THE SIOUX WORLD OVER



Albertson & Co., Inc. SIOUX CITY, IOWA, U.S.A.

EQUIPMENT

(*Continued from page 11*)

Corrosion-Resistant Wrought Iron Tubing

For installation in heat transfer and air-conditioning apparatus, corrosion-resistant wrought-iron tubing is now being manufactured to precise tolerances. According to the maker, specific services in which the tubing's resistance to corrosion and fatigue failure help to reduce the frequency of repair or replacement include: ammonia condensers, heat exchangers, pre-heaters, gas cooling apparatus, gasoline condensers, evaporators, cooling pipe and steam condensers. It is especially suitable for handling salt and brine solutions in air-conditioning systems.

The cold drawn tubing is comprised of high purity iron and iron silicate in physical rather than chemical association. This combination gives the metal a strong structure and the slag fibres, numbering some 250,000 per sq in., disperse the attack of corrosion forces and prolong life of tubing.

Physical properties of the tubing conform to those listed for welded wrought iron pipe in ASTM Specification A-72. The product is presently available in sizes ranging from ⅜ in. to 3-½ in. in outer diameter and in 14 to 8 gage thickness. It is supplied in lengths according to desires of the customer. *A. M. Byers Company, Pittsburgh.*

C-D-F TAPES of TEFLON*

- Heat Resistant—up to 500° F.
- High Dielectric Strength
- Strong, tough, durable

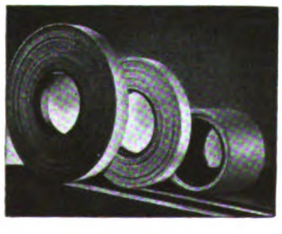
It is no longer necessary to spend time, effort and materials in frequent re-wrapping of field coils. Use C-D-F TEFLON tapes for the job—they have unusually long service life. Tapes are easy to apply, easy to handle. Rolls are supplied in a wide range of widths and thicknesses either in 100% TEFLON film or TEFLON glass fabric supported.

TEFLON has high heat resistance—withstands 260° C. (or 500° F.) without appreciably affecting its physical or electrical properties. It meets Class H AIEE standards for maximum hot spot insulation temperature of 180° C. TEFLON has practically zero water absorption and its electrical properties are little affected after long exposure to high humidity. Its dissipation factor and dielectric constant are extremely low and unchanged over a wide range of frequencies.

TEFLON has a wide range of applications in the railroad industry. For wire and cable coverings where the electrical properties must not suffer impairment even under extreme temperature and humidity conditions, TEFLON is the ideal material. TEFLON may be applied in single or multiple wrapping operations which may include a TEFLON glass fabric cloth supported tape on the outside for resistance to abrasion. TEFLON wrapped cables find extensive use in Diesel locomotive wiring where abrasion of exposed wiring, due to under-car blast, is an important factor.

If you are not now using C-D-F TEFLON tapes and want to know more about TEFLON, the most promising of new plastics, write for Folder T-52 with samples. For technical assistance call your C-D-F sales engineer (offices in principal cities). He's a good man to know.

*du Pont Trade Mark



Continental-Diamond Fibre

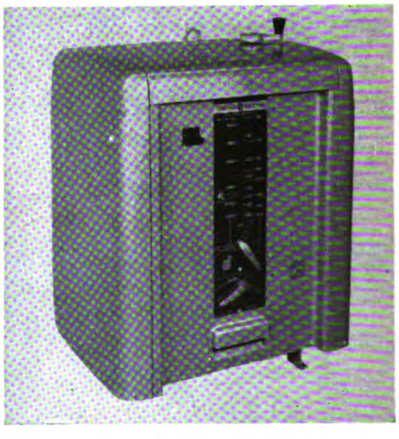
CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 104, DELAWARE

A C Welder

This heavy duty welder, Model SLP, for a wide range of a c welding production jobs is available in 300, 400 and 500 amp sizes. Its transformer is of shell type design using the saturable leakage path control system for adjustment of welding current. A secondary winding supplies current to the selenium type control rectifier for low-voltage remote control. No high voltage appears across any control coils, eliminating possibility of insulation breakdown or high voltage appearing under the rheostat handle.

The device has no moving parts; the core and coils are anchored in place. It is capacitor equipped for power factor correction. Three wheeled portable mounting is optional equipment. *Hobart Brothers Co., Hobart Square, Troy, Ohio.*



Rectifier-Type Welder

Now in production, this 300-amp rectifier-type welder offers full time arc force control for holding very short arcs with deep penetration. It features quiet operation and low maintenance cost.

Provided with a current range of 20 to 375 amp, the welder utilizes the moving primary coil design, obtaining current adjustments by separation of primary and secondary coils. Windings are of aluminum

(*Continued on page 143*)

EDITORIALS

Why the Frisco?

Contained within a special section of this issue is a comprehensive exploration of the mechanical department of one railroad—the Frisco. The 32 pages devoted to this study cover just about every aspect of the mechanical department from its overall organization to details of policy on the operation and maintenance of its cars and diesel. Two questions come to mind as to why such a sizable portion of *Railway Locomotives and Cars* is being devoted to a study of this nature.

First, why all this information on *one* railroad? By devoting a sizable section of an issue to digging deeply into just one department of one railroad we felt that we could present information of significance and value to all men in the department—and to those in other departments, for that matter—from the young man with little experience right up on to the department head. The young man can get an overall view of how a mechanical department operates while the department head can critically compare his ideas and methods with those of another road—the Frisco in this issue and others being considered for similar treatment in the future.

Second, why specifically the Frisco? We are not trying to say that this railroad has the best mechanical department in the country. Nobody could add up the good and the bad features of all railroads and come up with the answer as to which is best. The Frisco definitely belongs in the category of well-run mechanical departments. Its maintenance costs are favorable and, generally, have been declining over the past few years. It is an average size railroad. Its problems are typical of the industry, and its solutions are applicable to many other lines. Many of its ideas and methods should be of interest to men from other roads.

At the same time that we are presenting this analysis of Frisco mechanical operations, we are not neglecting or postponing the publication of other material of interest to our mechanical and electrical readers. The No. 1 problem of the railroad industry—the hot box—is dealt with in one of the feature articles and our regular coverage of electrical matters appears in its usual place, as do new devices, news and questions and answers.

Some Electrical Potentials

Present developments and future possibilities arising from new types of electrical equipment were discussed at the Winter General Meeting of the American Institute of Electrical Engineers held in New York, January 29—February 4, 1955. They are reported in the Electrical Section of this issue. Ten rectifier-type electric locomotives now being delivered to the New Haven constituted a topic of first importance. A performance report on the 100 rectifier-type cars now in service on the New Haven give this new type of motive power a clean bill of health. Since a rectifier operates as well at one frequency as another, the new cars and locomotives suggest straight electrification using commercial frequency (60 cycles) on the contact system with quantity-produced (diesel locomotive-type) traction motors.

Present types of germanium rectifiers suggest they might be used in locomotives and when, as, and if, silicon rectifiers are made practicable in large sizes, they will further improve the possibilities of such locomotives and cars, since they can tolerate a relatively wide temperature range.

Interference with communication lines by rectifier-type motive power made their use impossible when it was tried some years ago. Better rectifiers, aided by cooperation between the locomotive manufacturers and the communication circuit operators have successfully disposed of this problem.

Another subject of interest to all diesel, as well electric locomotive operators, are new types of motor and generator insulation. Under operating conditions common in railroad practice, it becomes a possibility that the copper of the coils may fail before the insulation.

Another subject presented is a d-c power supply for railway cars in which two relays have replaced a set of contact fingers and an exciter has disposed of the pole-changer. It is also described in this issue.

An electric rotary snow plow which utilizes power from a 1,600-hp diesel unit was described and discussed. Such equipment which can use so much power over a wide range of train speeds should have a salutary effect on snow removal in sections where rotaries are required.

The significant thing about all these developments is that they are almost revolutionary in character and they continue to appear in such numbers. The potentials of application of electrical equipment to railroad service are evidently far from being fully realized.

NEW BOOKS

RAILWAY CAR REPAIR SHOPS. A 28-page tabulation of railroad locations with an average monthly total of 811,820 minor, 133,422 medium, and 28,286 heavy rebuilding repairs. Based on statistics supplied Railway Age by 121 United States, Canadian, and Central American railroads. A first-of-its-kind study, listing 1,461 car, wheel shop and passenger car repair points. Prices: single copy, $2.00; 6 copies, $10.00; 12 copies $20.00; 25 copies, $35.00; 50 or more copies, $1.00 each *Simmons-Boardman Publishing Corporation, Research Department, 30 Church street, New York 7.*

Solid bearing cars earn equivalent of

$250,000 EXTRA REVENUE PER YEAR

on each 1000 car investment

You get more cars for your money when they're solid-bearing-equipped — and a bigger return per dollar of car investment regardless of traffic conditions.

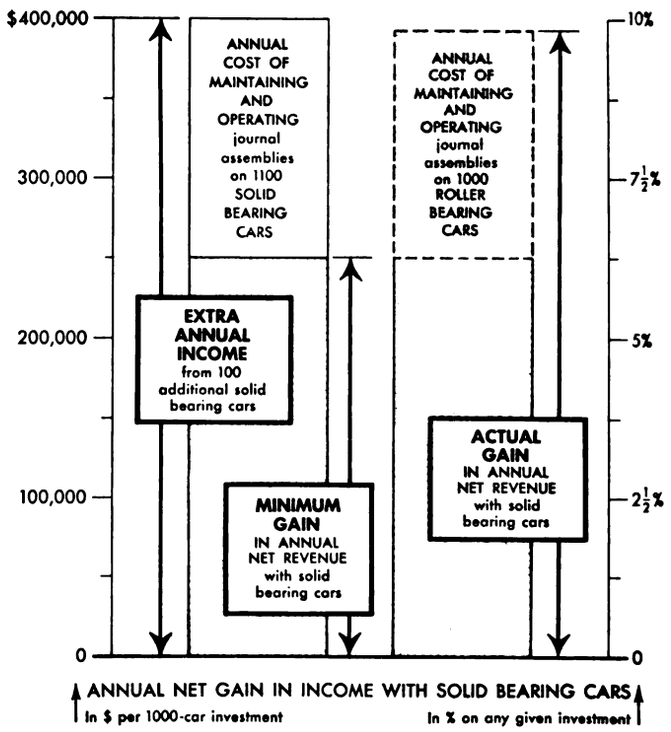
For the same amount of money needed to buy 1000 average roller bearing freight cars, you can buy 1100 or more solid bearing freight cars. And if you want to know what the *loss* on the roller bearing investment would be, here's a rule-of-thumb to figure it.

First, assuming the extra cars are needed, you estimate their average earnings. Then, from this sum, about $400,000.00, you subtract the difference, if any, in maintaining and operating journal bearing assemblies on 1100 solid bearing cars as opposed to 1000 roller bearing cars.

Conservatively, you'll find your minimum annual gain with solid bearings to be about $250,000.00, and it may be as much as $400,000.00.

By the same token, suppose you only need 1000 cars to meet your traffic requirements. With solid bearings, you reduce your initial costs by at least $600,000.00 and you get the same proportionate increase in return per dollar of car investment represented by the $250,000.00 to $400,000.00 above. And since both freight revenues and bearing operating costs are proportionate to car use, this comparative increase in return with solid bearings holds true regardless of traffic conditions.

Write us for a detailed analysis of the economic advantages of solid-type bearings for freight cars. We will also be glad to give you information about ways to improve journal bearing performance. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.



The left hand column indicates the average extra annual revenue that can be earned by buying 1100 solid bearing cars instead of 1000 roller bearing cars, and the center box indicates the minimum revenue gain that would result if the roller bearings could eliminate all maintenance and operating expense. The actual annual net gain, of course, would be this minimum gain plus roller bearing maintenance and operating costs as indicated in the right hand column.

MAGNUS

Solid Bearings

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

Sometimes a successful operation depends upon the presence or absence of a sound management philosophy. The outline of this philosophy as set forth by Mr. Tuck may be the key to the "Frisco Story" on this and succeeding pages.

Communications-A Mechanical Department "Must"

The Frisco feels highly complimented by the recognition being given it this month by Railway Locomotives and Cars. Here on the Frisco, we are proud of the progress we have made in the operation of our mechanical department, but to have a publication such as this pay a tribute to us further enhances the pride we have in our organization.

. . . management policy . . . uncommon . . .

The Frisco has indeed made much progress in the operation of its mechanical department since it emerged from trusteeship in January, 1947. Behind this progress has been a management policy somewhat uncommon to the railroad industry in general, and perhaps even more uncommon to mechanical departments in particular.

. . . no ivory towers . . .

Perhaps the phrase which might best describe this policy is this: "There are no ivory towers on the Frisco." This was firmly established when President Clark Hungerford assumed command in 1947. Frisco employees of all ranks quickly discovered that Mr. Hungerford's idea of running a railroad was to get around on this railroad. This idea had merit, supervisory personnel learned when they tried it, too. They found they were running more efficient, happier departments and they also amassed a wealth of new ideas which helped to make their own jobs easier.

To sell 'want to' . . . is . . . most important

In the mechanical department, there have been outstanding results of following this system. To sell the "want-to" attitude throughout the entire department is, in my opinion, the most important single function of mechanical department supervisors.

. . . establish . . . communications . . . up

It is a simple matter for any supervisor to establish communications "down," but it takes time and effort on the supervisor's part to get communications "up." One of the most effective ways to bring about these "up" communications is to have enough interest in your men to know them—really to know them, so that when you walk into a shop you not only can call them by name but you can sit down and talk freely with them. It is at times like this with the employee in his own environment, so to speak—rather than across a desk in your office—that he feels free to express his ideas about his job and how he can improve it.

. . . benefit . . . is immeasurable . . .

The amount of benefit we have derived from this practice on the Frisco is immeasurable. Not only does this benefit Frisco operations, but it benefits those of us in supervisory jobs—it keeps us from adopting a "know-it-all" attitude and from "getting too big for our britches."

. . . effective . . . semi-annual meeting . . .

It is equally important to have two-way communications within the supervisory family. One way we have found to be effective is a semi-annual one-day meeting held between the chief mechanical officer and about twelve foremen. These foremen are representatives of an unofficial foreman's organization. They meet by themselves in the morning to discuss common problems and to set up an agenda for an afternoon session with the chief mechanical officer. In this way each foreman has a chance to have his problems considered by his fellow workers and also by his superior officer. At the same time, the other foremen learn solutions to problems they themselves may face some time and the chief mechanical officer discovers the chief difficulties confronting his lieutenants.

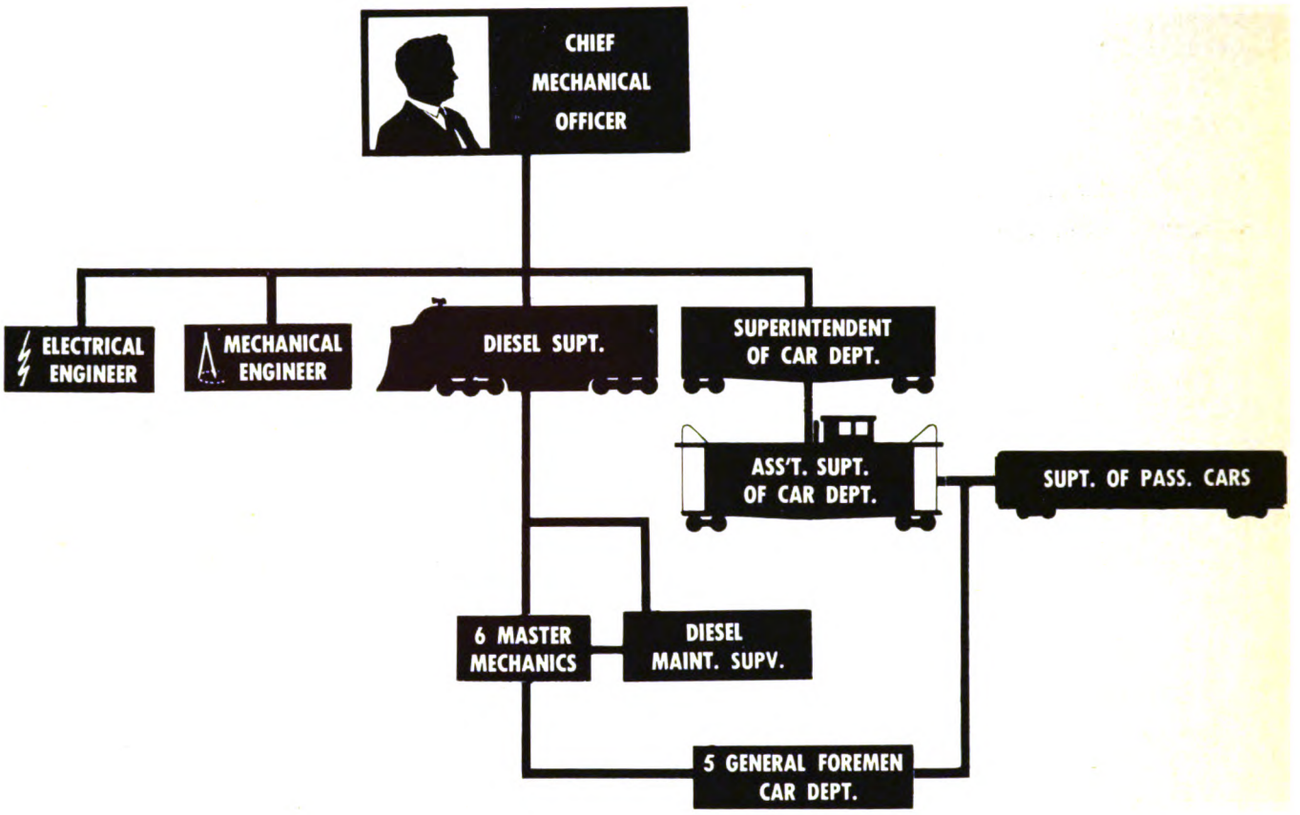
. . . two-way communications . . . (effective) . . .

How effective these methods of two-way communications have proven to be is typified in a recent job our department performed. We were given the task of producing a piece of equipment to be used as a prototype. The problem was explained to the men who would have to build it. The result was that they not only built exactly what we wanted but constructed it for several hundred dollars less than we expected. It was gratifying to us to note that these men were just as interested as we were in saving money while doing a good job.

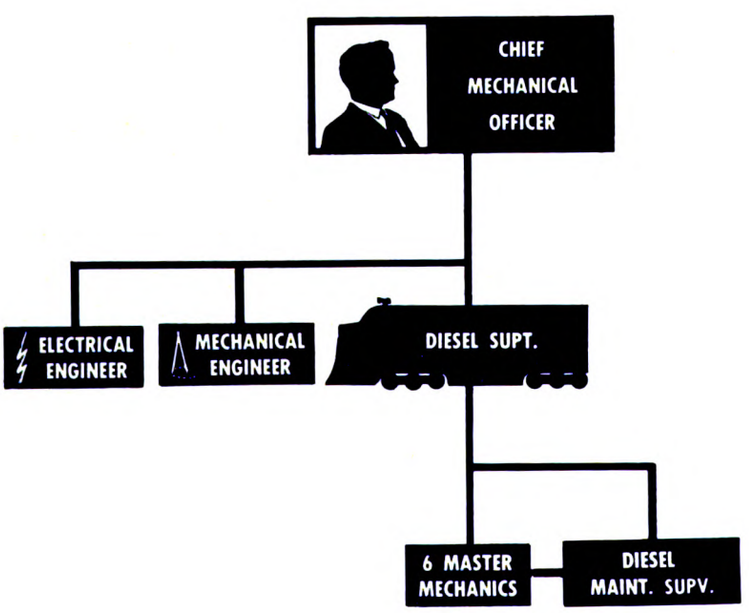
This, then, is what a program such as this can accomplish. We feel that it has worked well on the Frisco.

E. F. Tuck
Chief Mechanical Officer

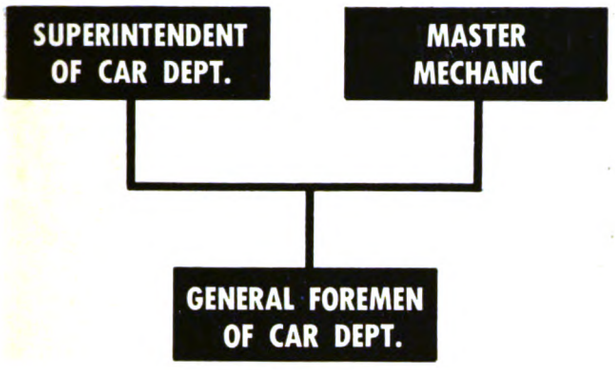
How the Mechanical Department is Organized



No two mechanical departments are organized alike and there are many ways to allocate responsibility and authority. On the Frisco a group of sub-department heads report directly to the CMO. The most striking characteristic of the organization is that the electrical engineer does less than half of his work for the mechanical department. Electrical maintenance matters in the diesel department are under the direction and jurisdiction of the diesel superintendent. The role of the diesel supervisors is to act as an aide, or staff assistant to the master mechanic. The supervisor in each territory also works on any special problems to which he may be assigned by the master mechanic with the approval of the diesel superintendent.



The mechanical engineer and the electrical engineer are essentially staff jobs to render specialized advice when requested. The master mechanic has direct charge of maintenance work on his division. The diesel maintenance supervisor and his staff represent the diesel superintendent



The master mechanic has somewhat broader jurisdiction than is general throughout the railroad industry. He has charge of all mechanical equipment—both car and diesel—in his area and his authority does not end at the back shop as on some roads but includes jurisdiction over heavy repairs. He is in direct charge of car general foremen on routine operating matters while the superintendent of the car department is in general charge of these foremen in regard to policy matters

MAN-POWER AND EQUIPMENT STATISTICS

Equipment handled by the mechanical department includes:

417 diesel units

25,419 freight cars

384 passenger cars

1,649 work service units

446 autos, trucks, etc.

These are handled by:

1,208 locomotive department employees

1,603 car department employees

THE ROLE OF ORGANIZATION is told partly by describing how the mechanical department is built up. Equally important side are the areas where the mechanical department works jointly with other departments and how joint functions are divided.

Joint operations with the test department include, for example, the application of molybdenum di-sulphide on freight car journals to check its benefit in reducing hot boxes. The dry form of this compound is also being considered for application to passenger car diaphragms and truck center plates. Where specialized knowledge is more likely to be found in the lab than in the shop, as for example in luberizing cast iron pistons, a lab man will supervise the entire operation.

Cooperative Shop Layout

Shop design and layout is more of a cooperative venture on the Frisco than on most other lines. The road has an architectural department which is staffed exclusively by architects rather than engineers. It handles all matters relating to the comfort and morale of employees at work, including such innovations to railroading as the installation of wired music in the mechanical department's office headquarters in Springfield. Its functions therefore include not only furnishing and decorations for offices, but the pleasing appearances of shops as well.

The architectural department also makes time studies of operations for laying out shop interiors. It follows the general plan of constructing a building around the area needed for the repair work rather than the reverse procedure of trying to fit a diverse group of repair operations into a pre-conceived floor plan.

"Buy" Mechanical Items

The master mechanic acquires materials from the stores department in much the same way that a customer buys goods at a retail store. Each master mechanic is given a budget and he can use this budget pretty much as he wishes—varying his employment or his material purchases each month as he desires just so he does not exceed his allotment. Individual master mechanics can also trade items, e.g., if Tulsa has an excess of cylinder heads but is short on pinion gears, and the reverse were true at St. Louis, the two points could trade off.

There is no "charge account" equivalent. The master mechanic cannot borrow against next months allowance if he uses up his budget. To help him avoid using up his budgetary allowance too early, the accounting department gives him a statement on the 14th and 21st day of each month telling him how much he has spent to date for material and labor and how much he still has to go. Like any quick estimate, the figures are not accurate to the nearest penny but are within one per cent.

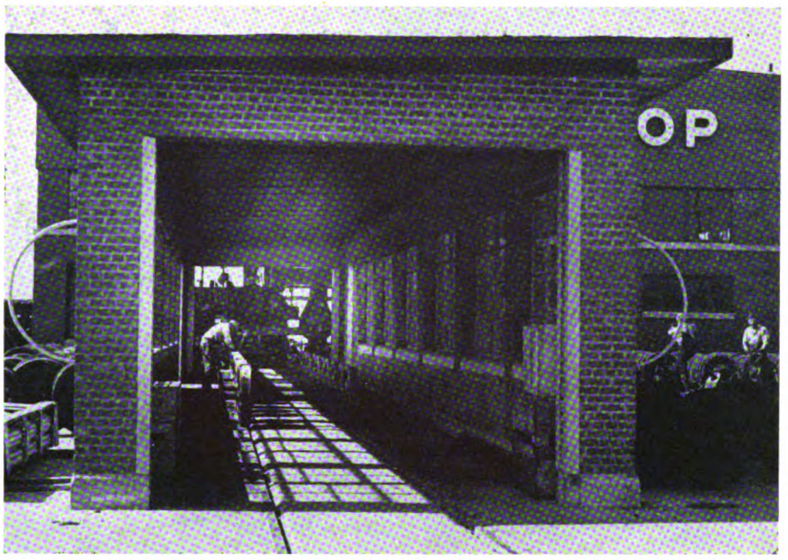
How Costs Are Charged

The Frisco does not keep detailed costs on individual units of either car or diesel equipment. Parts are charged to one of four classes of diesel power—passenger, freight, switch or road-switch—not to any particular locomotive or to a particular builder's locomotive. In car work, cost records are kept by car series.

One of the key methods used in tying the different segments of the mechanical department together—and of tying the mechanical department itself to other departments—is the establishment of effective communications, both sideways between different departments and vertically within any one department such as the mechanical. The mechanical department employs a number of interesting methods to encourage not only the relatively easy communications down the line, but the more difficult to obtain communications from the bottom up.

General Car Department Policy

What the Frisco Thinks About:



Most modernization of plant has occurred in the diesel department and on selected rip tracks. One exception is this up-to-date wheel shop complete with canopy on the entrance track to the demounting press to protect the workers from the rain and cold

- **Buying vs Building Cars**
- **Welded vs Riveted Cars**
- **Hot Box Prevention**
- **Speeding Train Inspection**
- **Priority on New Facilities**
- **Cycling Cars in Pools**
- **Locating Passenger Facilities**

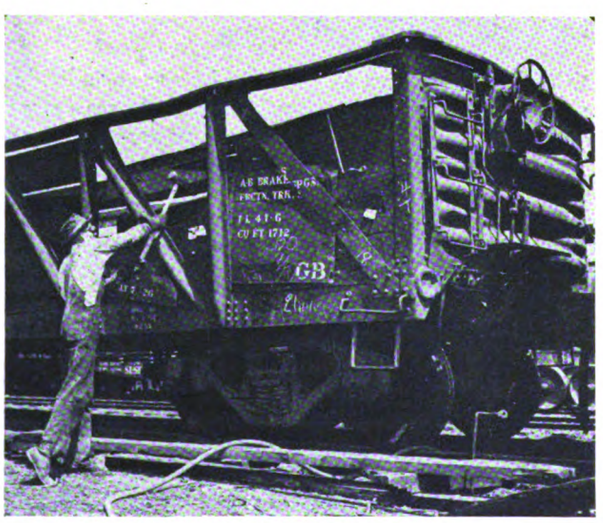
Because of the Rules of Interchange there is less freedom in the car department to be individual in ideas and practices than there is in the locomotive department. None the less there are many spheres in which the car department of one railroad can and does differ in its operation from that of another. Here are some of the ideas the Frisco has in running its car department.

The Frisco classifies freight car repairs three ways—heavy repairs costing over $150, medium repairs costing between $50 and $150 and light repairs costing less than $50. Medium repairs are frequently handled at major rip tracks which handle repairs costing up to about $275.

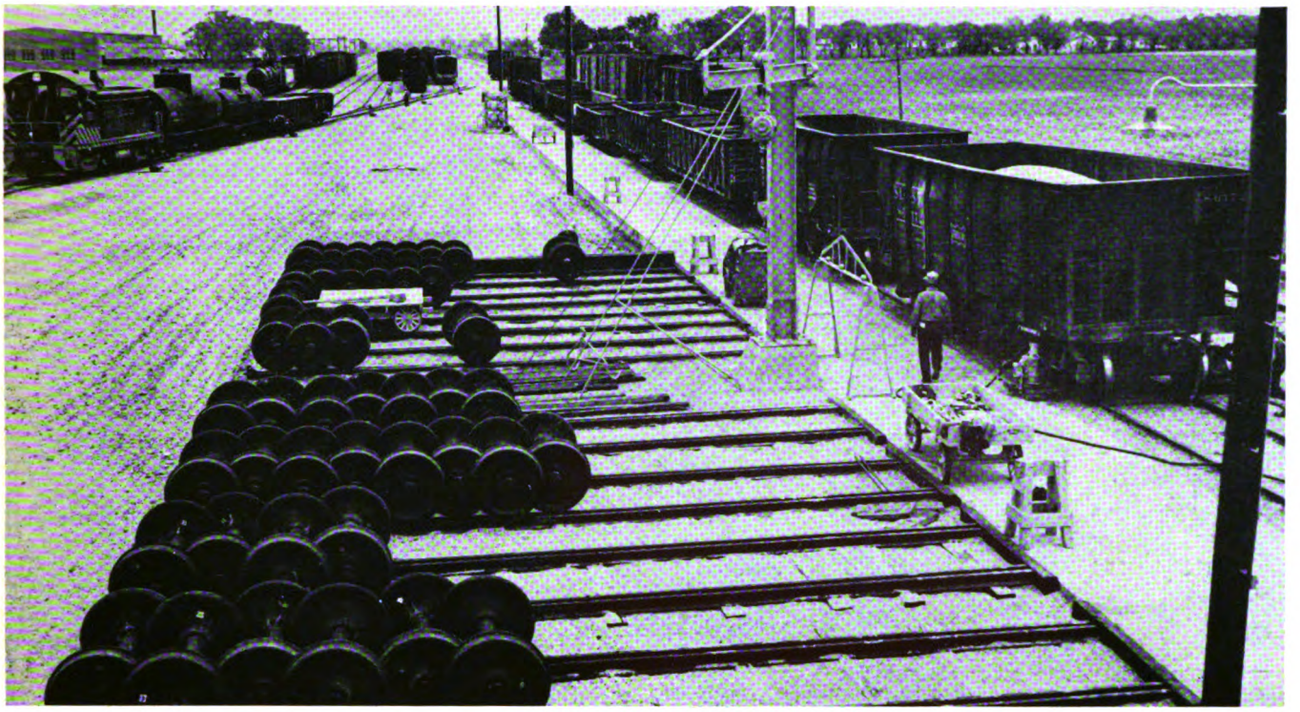
Heavy repairs are done principally at Springfield (house cars and work service equipment) and Memphis (open top cars) with most of the work done outdoors at both places. Neither facility is well equipped for the work it does. In general, car repair facilities on the Frisco—except for rip tracks as new yards are built—have not been modernized to any great extent although studies are being made to correct this. Studies are also being constantly made of shippers' complaints to eliminate causes of damaged lading in cars undergoing repair.

A special card system is used in classifying cars, and this is done by the mechanical inspector wherever possible as he is better trained to assess the condition of the car as to its ability to handle a given load, e.g., a splintered floor would not hurt a load of refrigerators as much as defective draft gear whereas the reverse would probably be true for a load of flour in sacks.

Loss and damage work is handled by a department headed by a superintendent with three supervisors who work with freight agents in investigating damage and devising ways of preventing it in the future. The mechanical department does not play a very active part in this except to serve primarily as a consultant in matters in which they have the most knowledge and background.



While the Frisco does not build any new cars, the road does an extensive amount of complete rebuilding on the theory that this gives about half the new car life at a fourth the cost



While modernization of heavy repair facilities is still in the planning stage, four rip tracks have received concrete platforms, new buildings shop and lighting

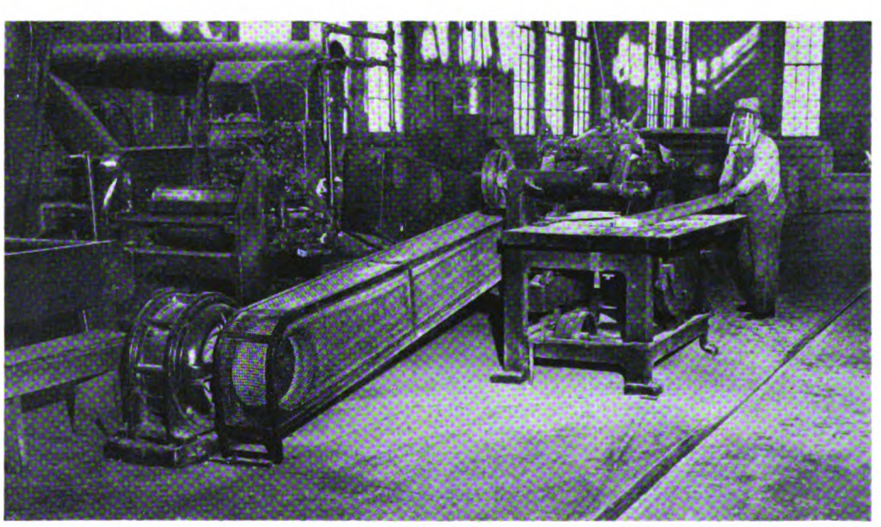
Temporary methods of upgrading cars by the use of paper lining in older cars has proven advantageous in utilizing the older cars for certain types of loading. This work is carried on at the light repair tracks, over the entire system with the greater portion of the work assigned to those areas where this type car can be used.

Fifty new cars with nailable steel flooring were received in 1954 and 265 cars 25 years old were rebuilt and equipped with the ASF ride control package unit.

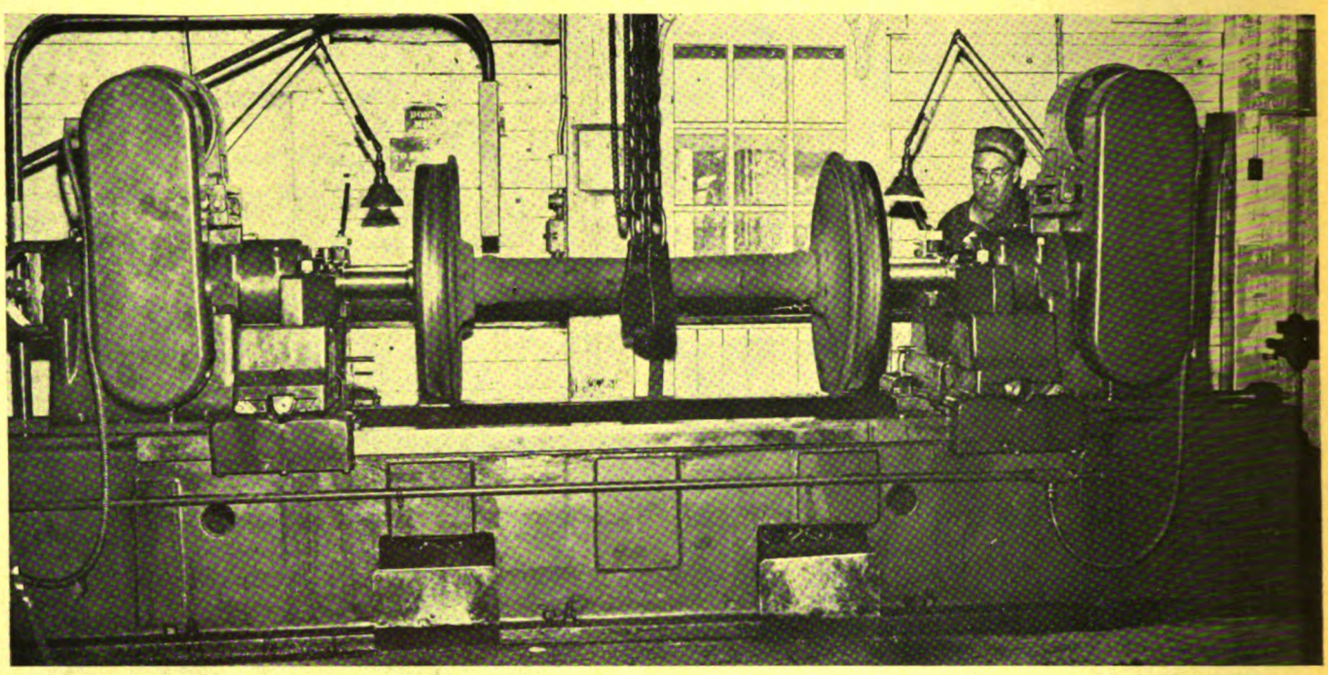
The policy of rebuilding freight cars is popular on the Frisco, which feels that the average rebuild costs about one-fourth as much as a new car and gives at least half as much life (15 or more years vs 25 for a new car). Whether this is all net gain or not is unknown. No maintenance cost comparison has been made between the rebuilt and the new cars because individual cost are not kept on cars; the only figure available is the total maintenance cost per year per average freight car.

The Frisco is not contemplating any new passenger equipment for the near future, and is not interested in the newer designs of lightweight passenger equipment at this time. What interest there is in this type equipment is more from the standpoint of its possibilities for reducing cost than for its possibilities for building up business by improving schedules.

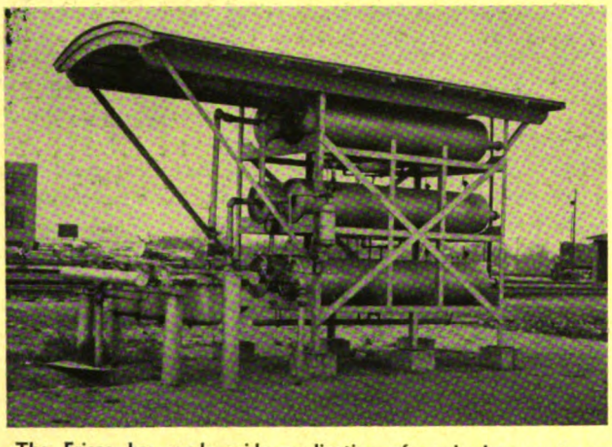
One maintenance practice that is somewhat of an innovation is the overhauling of engine-driven air-conditioning units in the roadway equipment shop (where all shop



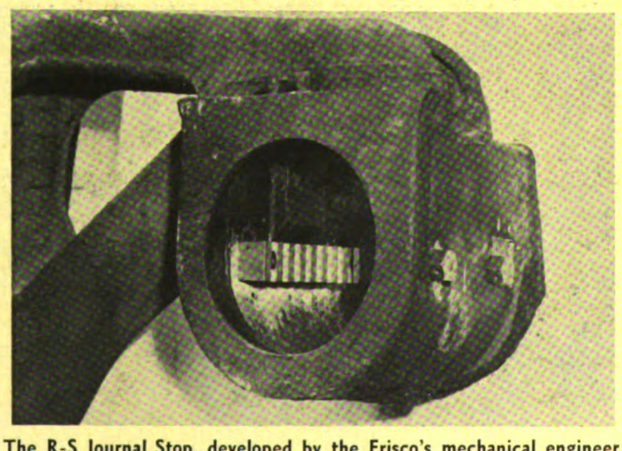
Electric motors from locomotive shop machines no longer needed for diesel maintenance are being salvaged to power various car shop machinery that was formerly belt driven



Athough most wheel work has been centralized at Springfield, journal lathes are retained at four rip tracks where more than 15 pairs of journals a day need turning



The Frisco has made wide application of yard chargers to reduce frozen train lines and to cut about in half the time required to charge a train by the locomotive alone



The R-S Journal Stop, developed by the Frisco's mechanical engineer, J. L. Ryan, and now marketed by Magnus, has been applied to 100 box cars after successful trial application on one truck on each of nine ballast cars

trucks are also overhauled). Done every two years, the work is handled in this shop as it is equipped to take care of all work on all off-rail internal combustion equipment from the M/W department and other engines of moderate size.

Less Box Working—Fewer Hot Boxes

At the present time thorough inspections are given to freight trains at major points while minimum inspections (feeling journal box lids, required air tests, etc.) are given at crew change points.

As an additional means of improving operation and building up business, the Frisco, as an experiment, a year ago July ran a train straight through from St. Louis to Ft. Worth (700 miles) with no intermediate attention and had no hot boxes. This experiment was made to check an idea that boxes are over-oiled and overworked, and that a long layover of itself could increase the chance of a hot box by allowing the oil to get cold and thereby reducing the lubrication of the journal.

More Effective Lubrication

One advantage in keeping this servicing time at a minimum or eliminating it altogether at intermediate points would be that the bearings would stay hot and the oil would remain fluid during a short layover. Thus effective lubrication would not have to wait for the cold journals to warm up but would take place as soon as the train started out. The harmful effect of over-oiling was shown in another way. A group of cheese cars were having an undue number of hot boxes leaving Springfield despite extra attention. One reason for the hot boxes was the nature of the movement. These cars stood around for some time awaiting loads. Another was that the cars were cut into a train in which most of the other cars had been

running and the bearings were warmed up. The cheese cars were thus cut cold into a warmed-up train at a point from which a fast start was made.

Filling the boxes to the mouth with oil was not the solution—more hot boxes resulted. It was found that too much oil floated the lint in the waste and allowed it to get under the brass. The hot box problem was solved by eliminating the extra oiling and coating the journals instead with molybdenum-disulphide to provide lubrication until the bearings warmed up and the oil became fluid enough to lubricate properly.

So far the Frisco has not engaged in any of the Insurance Company plans for leasing equipment such as cars or locomotives. However, all types of ideas are being investigated.

Plastics are being investigated for the backs and sides of passenger car seats (everywhere except where the passenger's body is in continuous direct contact.) Fabric would be used where the person sits and where his back rests.

The plastic is expected to be cheaper to buy and apply, to stand abuse better, and to present a better day-to-day appearance as it is washable.

Freight and Passenger Cars Pooled

Borrowing a leaf from the locomotive department's book on cycling and pooling diesel power, the car department has developed a couple of pools of their own. Five passenger car pools centering around three points release an average of 7 head-end and 5 passenger-carrying cars for use per day by reducing lengthy layovers. In some instances the pooling is facilitated by doing passenger-car servicing operations at or near the station instead of some distance away at the freight yards as had been the past practice.

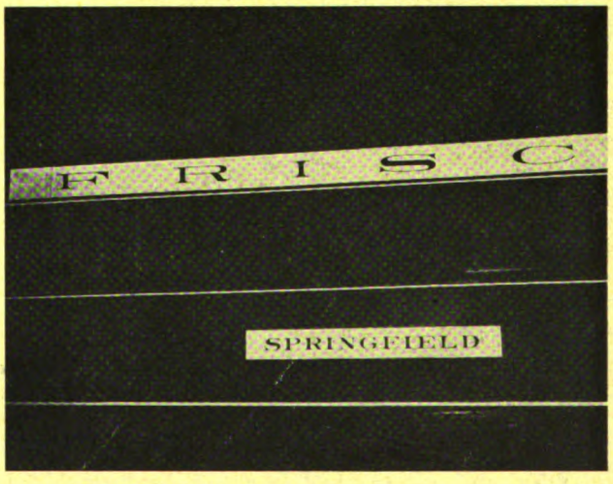
A form of pooling is also employed on some freight car movements. For example, special group of 50 cars were selected to haul lead and zinc ore. This service required cars with good floors and lining to a height of about 5 ft. Cars to meet these qualifications were found to be previously sitting around idle much of the time because of leaky roofs or other defects that rendered them unfit for most commodities but which would not interfere with the lead or zinc ore movement as these commodities were loaded wet. Keeping these cars in this service also eliminates continual cleaning which had to be done before any other commodity could be hauled in one of these cars.

Supplying Coach Steam

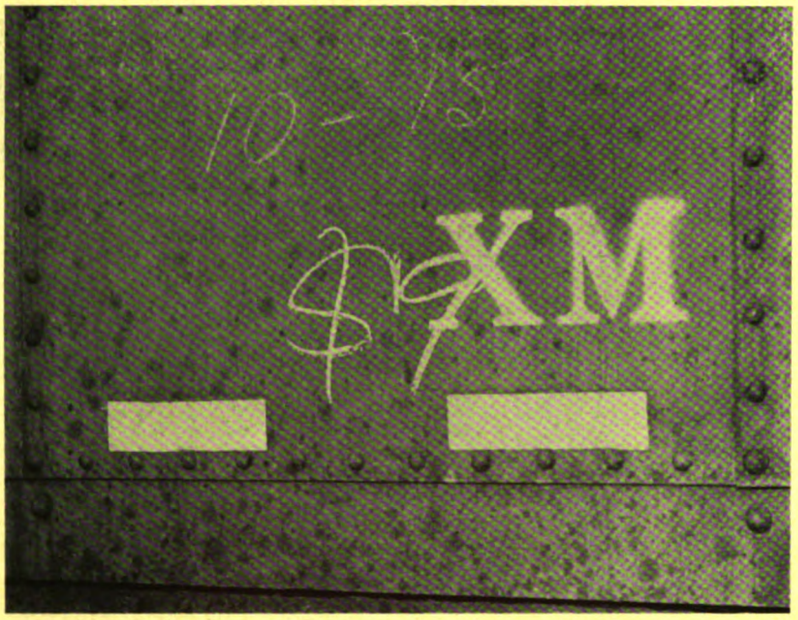
Dieselization reduced the requirements for steam and air to the point where it became economical to discontinue stationary plants and install automatic air compressors and steam generators. Where necessary to heat coaches high pressure generators were installed. Otherwise the low pressure type was used.

Dual installations of both generators and compressors were made so that the piece of equipment would be available in the event of a breakdown or failure. Compressors are equipped with starting alternators so that each machine will accumulate about the same amount of wear. To date, 12 stationary plants have been converted to this automatic equipment with some installations paying for themselves in as little as three years time.

The Frisco lets cars go from Class AA down to rough freight only before rebuilding and then rebuilds to AA again rather than to be continually upgrading one or two classifications at a time



Scotchlite is being applied to passenger (and some freight) cars for both safety and advertising purposes. Scotchlite signs are made at Springfield



This chalk mark 10-15 on the corner of the car shows that oiler pool No. 10 did all inspection, packing and oiling work on the 15th of the month. It is one of a series of marks that forms the key to . . .

An Effective Hot Box Control Program

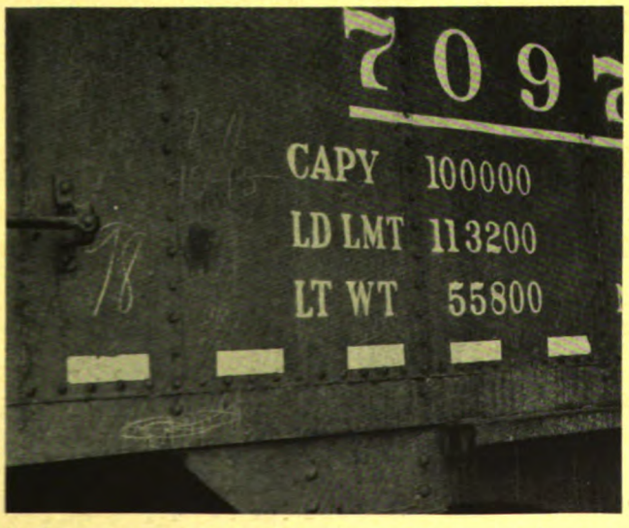
Among the more promising systems for reducing the hot box problem is the one employed by the Frisco on cars leaving St. Louis that:

1. Pinpoints responsibility for every hot box whether due to man failure or material failure.
2. Speeds up train inspection by providing a simple means to indicate preliminary inspection work done to cars before being made up into a train.
3. Depends primarily on nothing more complicated than chalk marks and . . .
4. Is therefore simple to administer and supervise . . .
5. Yet does not fail if rain washes the marks off.

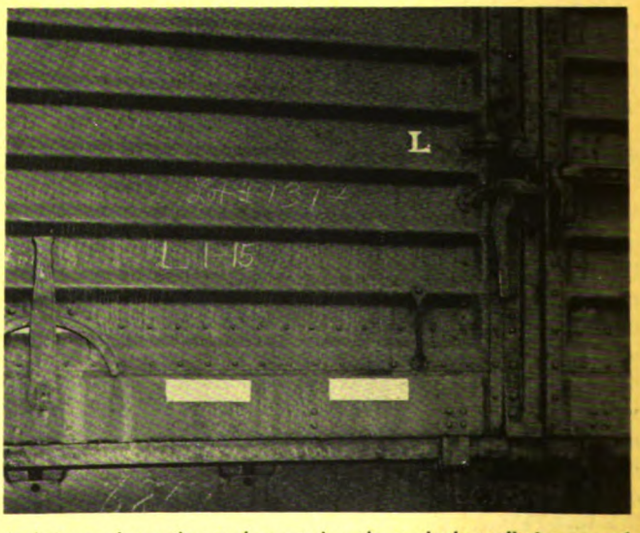
The principle of the Frisco system at St. Louis is a group of oiler pools of two men each using a system of chalk marks on different places on the car. In any given pool one man always works the engineer's side of the train, the other man the fireman's side to simplify later checking.

When an oiler completes his work (oiling, adjusting packing, necessary inspection, etc.) on a car on an outbound train he marks his pool number and the date in the corner of the car. Should the car develop a hot box at any place during the remainder of its journey on the Frisco —despite how far that point might be from St. Louis— the symbols will indicate just where the box was packed, by whom and on what date (just the numeral is written for the date as the month is obvious).

Where several pools are assigned to long trains, each



If the car is switched out of the train, pool 10's marks is crossed out and the new pool and new date of inspection written in—again in the corner



In between inspecting made-up trains, the pools do preliminary work on cars yet to be classified and mark their number and date in the *center of the car*

pool works one block of cars. For example, on a 100-car train there might be four pools, with the first pool taking the first 25 cars, the second pool taking the next 25 cars, etc. By assigning the pools to definite blocks of cars and keeping a record thereof it is possible to determine who oiled a given box that runs hot even if the chalk mark washes off as it often will during rain.

Tracing is of course somewhat more complicated in such instances—but not unduly so. The general car foreman has a "hot box blotter" which shows what pools worked what parts of what trains. When a car is cut out down the line, its position will tell which pool worked it. If the train has been re-classified, the car number is enough to determine (from the consist records) where it was in the original train, and therefore the oiler pool that worked it.

How Inspection is Speeded

When the oilers are not busy inspecting trains, they work cars in the yards bringing the oil level to one inch in the box and any other work that can be done in advance. Such cars are marked by date and pool number *in the center, not the end.* These cars are inspected again after being switched on a train, but the second inspection will of course take less time.

The pool making the final inspection puts its number *on the corner* of the car in addition to the mark in the center. Should the car be switched out of the train the last minute to reduce tonnage or for some other reason, the next pool that gives final inspection draws a line through the corner mark and adds its own. This procedure is followed on all inspected cars switched out of trains, whether they had received preliminary inspection and were center marked or not. The center mark is not crossed out, however, as something may occur later that would make it desirable to know which pool had given the preliminary inspection.

The Human Relations Angle

The personnel at St. Louis yard handles about 14,000 cars a month with an average of four hot boxes a month in the winter and eight to ten in the summer. The program to accomplish this, like any other program, depends largely for its final success or failure on how well it is sold to the men themselves and how hard they try to make it work.

The general foreman at St. Louis feels that this is particularly true in car inspection work because (1) an oiler has to take care of from 400 to 600 boxes per shift in all kinds of weather; and (2) you can't watch a man very much of the time when his range of operation is as large as a car inspector in a big yard.

It is also felt that everyone from the top down must feel that the hot box car be stopped before any program to stop it can be successful. It is also essential that one man is not blamed for the failure of another, and when a failure occurs the man responsible be informed of the specific cause for his future guidance.

The general foreman gives each oiler a copy of the lubrication manual and sees him as often as possible to help clear up any problems he may have. Hot boxes on the road are taken care of by men stationed at major or intermediate terminal. When the dispatcher notifies a man that there is a setout in his territory he makes permanent repairs if possible with the equipment he has, or if the trouble requires more extensive work, like a cut journal, he makes temporary repairs for moving the car to the nearest terminal for changing out the wheels.

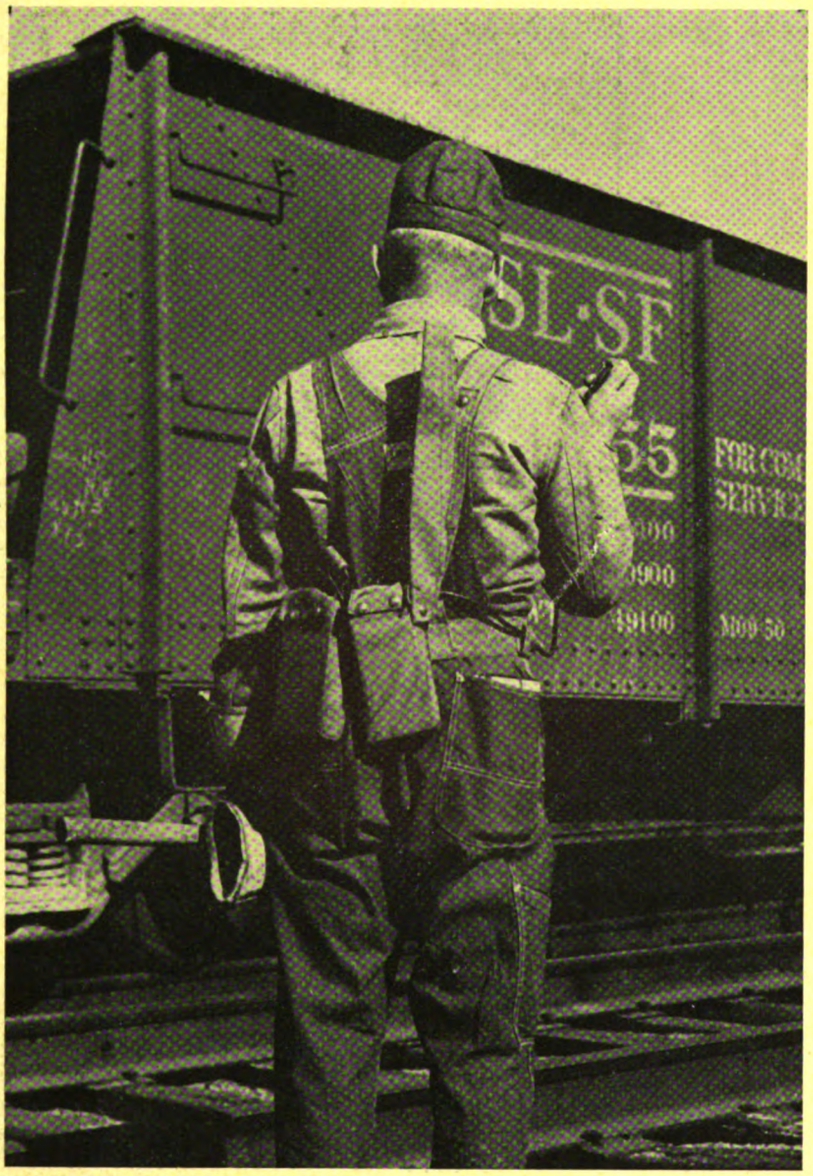
Molybdenum-Disulphide ("Molycoat") to cut hot boxes is being tried at some points to see if it will lubricate the journals during the period between the time the train starts and when the oil becomes warm enough to flow and lubricate the bearing surfaces. If the brass is changed, the Molycoat is applied to it; otherwise it is brushed on the sides of the journal

Oiling time on made-up trains is cut to a minimum by a series of strategically located concrete storage bins for oil cans and jacking equipment. The bins are spaced every 250 ft, or five car lengths, along the outbound inspection track. They serve as a point for the oilers to exchange an empty oil can for a full one without stopping to take the time to refill.

The 250-ft spacing was chosen because the two-gallon cans hold enough oil for about one side of five cars. Thus the oiler passes one of the boxes at just about the time that his oil can becomes empty. He leaves the empty can in the box and takes out a full one, oils the next five cars, repeats the exchange, and continues this procedure until all journal boxes have been oiled. The empty cans which were left in the bins are filled between trains when the oilers have time to spare.

The boxes are 2 ft wide, 2½ ft deep and 4 ft long. They hold ten oil cans, a journal jack, wheel iron and jacking blocks. A two-part steel cover is hinged in the center and is painted yellow for night visibility. The cans are filled from 8,000-gal tanks at each end of the yard.

Concrete storage bins are located every five car lengths to exchange empty oil cans for full ones



Car Inspection Aided by Novel Use of Radio

1 Instead of walking up to a couple of dozen car lengths to reach a telephone to report a defect, the car inspector can now speak into a portable microphone and his message will be reproduced on . . .

Car inspection is expedited by a novel communication system developed by the Frisco and installed at yards in Springfield, Tulsa, St. Louis & Memphis.

Each car inspector is equipped with a light-weight portable radio transmitter set (nick-named "Dick Tracy" sets), which he carries with him as he makes his inspection of a train. If he finds a defect on a car, he speaks into the microphone, and his message is transmitted by radio to a fixed radio receiving station. The message is then reproduced on paging-type loudspeakers. At Springfield, for example, there are 27 speakers on poles at various locations in the yard and five are in offices, one of these being in the car foreman's office. Thus, this statement is heard not only by the car foreman but also by the other car inspectors working on the train and other men who are interested. When the foreman hears an incoming statement concerning a defect on a car he speaks into the microphone on his desk and his statement is broadcast on all the fixed loudspeakers in the other four offices and at the 27 poles throughout the yard.

Under the previous method, when an inspector had completed his job, he had to walk, perhaps half the length of the yard, to reach a telephone to report bad order cars to his foreman. As three or four inspectors usually worked a train, the foreman had to wait until all men had phoned in before he could call the yardmaster with the list of defective cars. With the new communication system, all the inspectors working on a train report defects when they find them, and then report when they finish their work on the train. Thus, the foreman can phone his list to the yardmaster at once—the new communication system saves a lot of time.

Adds to Both Safety and Speed

The new system also has a safety feature. Should an inspector spot a defect that he can remedy himself, he simply announces over the microphone that he is going to work on a particular car. Locomotive crews and other inspectors in the area hear the warning as it comes out over the paging horns. This eliminates the time wasted by an inspector in having to walk to the end of the train to set up a blue flag. Instead he merely calls to an inspector at each end of the train asking him to set the flag in place. When the inspector gets an acknowledg-

ment that both ends of the train are blue-flagged, he can go ahead with his work—assured that he has blue-flag protection.

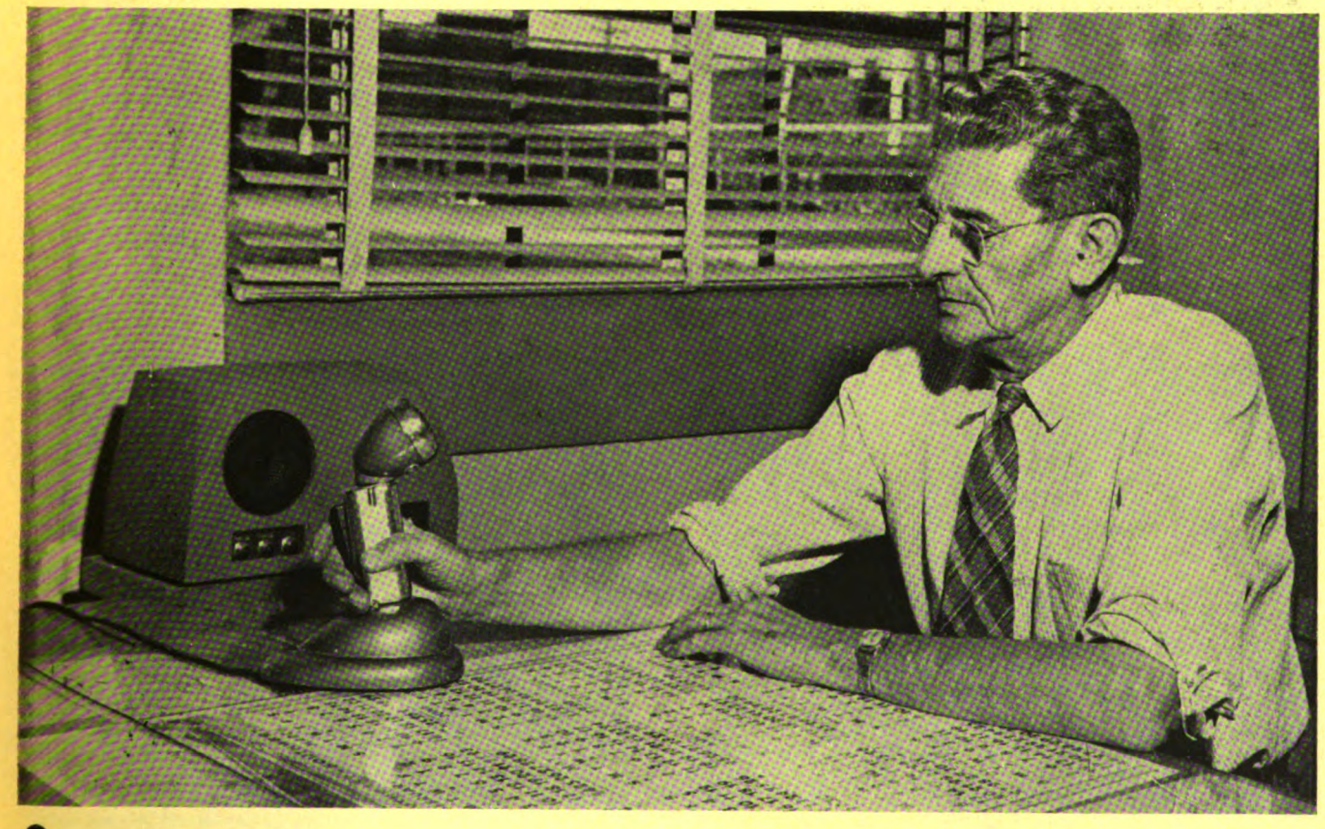
Radio is also an aid in making the terminal test when a train is ready to move. Where the locomotive and caboose are so equipped, however, the regular train radio is used instead of the small portable transmitters. The regular radio is preferred as the messages are broadcast directly inside the caboose or locomotive cab rather than outside on the pole-mounted loudspeakers, which makes it easier for the inspector in the caboose and the man in the cab to hear each other.

The radio used by each car inspector is enclosed in a canvas pouch, and the batteries are in a second similar pouch. The two pouches are attached to the inspector's belt with a shoulder strap, as shown in one picture. A flexible wire connection extends from the radio set to the small palm-type microphone, which can normally be carried in the man's pocket.

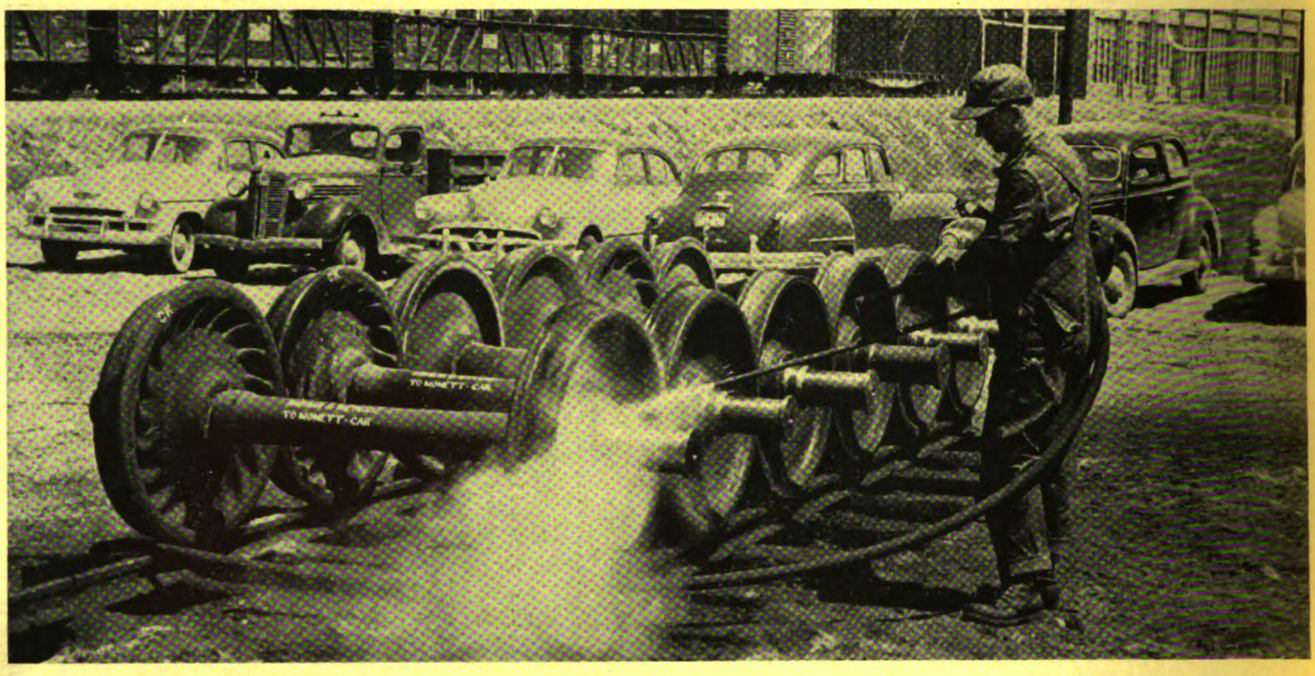
Range Over A Mile

These small radio transmitters operate on a separate frequency, so that they do not interfere with the other yard radio. The power output is 0.1 watt. The range of a transmitter is approximately a mile from the base station (which picks up the message and transmits it to the office speakers and to the 27 outdoor loud speakers). Thus the system is adaptable to any size yard. The dry-type batteries to operate the radio transmitter have no rated life, but the Frisco's experience is that the "A" battery lasts about 30 days and the "B" battery about 60 days.

2 Loudspeakers mounted on 27 poles at various locations in the yard and five in the . . .



3 Offices—Where microphones permit the car foreman and other yard supervisors to speak also into the 27 loudspeakers

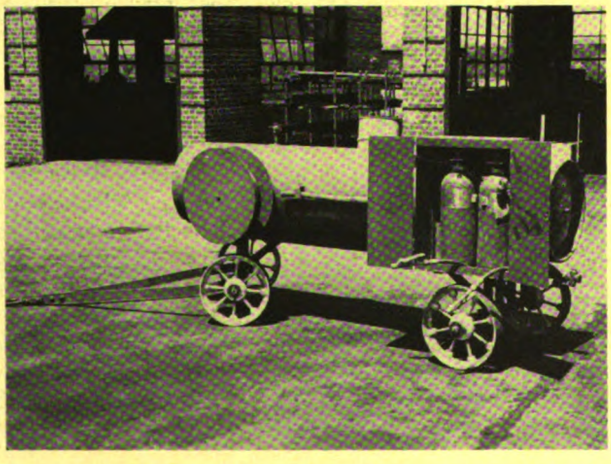


Wheels are steam-cleaned before turning journals to avoid fouling up the cutting tools and burnishing rollers and for better inspection of the plates

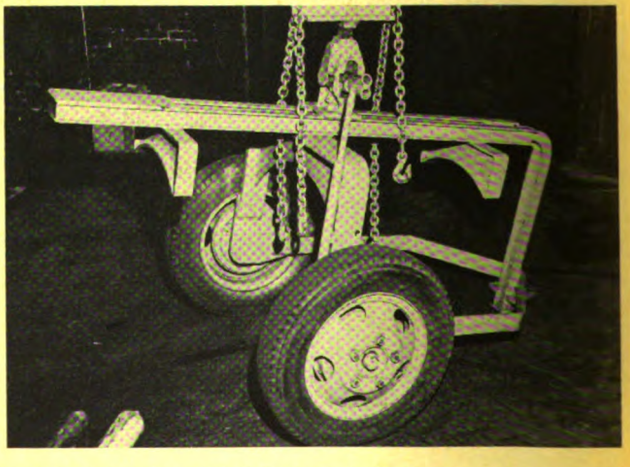
Arrangement for transferring a wheel set between tracks is made of heavy tubing. Wedges roll the wheels on ball bearing dollies while stops on the far end line up the wheel set for unloading on the adjacent track

Rip Track Operations

The Frisco keeps rip tracks clean and neat to a degree not commonly found on the theory that neat surroundings have a psychological effect on causing a man to want to do higher quality work. All concreted rip tracks are swept several times a day with power sweepers. Several points paint work equipment (jacks, stands, A-frames, etc.) bright yellow so that it is evident, even from a distance, whether or not these items are being stored neatly and safely.



All major rip tracks have a fire-fighting wagon equipped with both fog nozzle and dry extinguishers



Truck-hauled trailer with built-in jack for changing out a pair of wheels on the road

Painting jacks, tripods and other rip track equipment bright yellow makes it easy to see whether they are stored neatly in a straight line midway between tracks

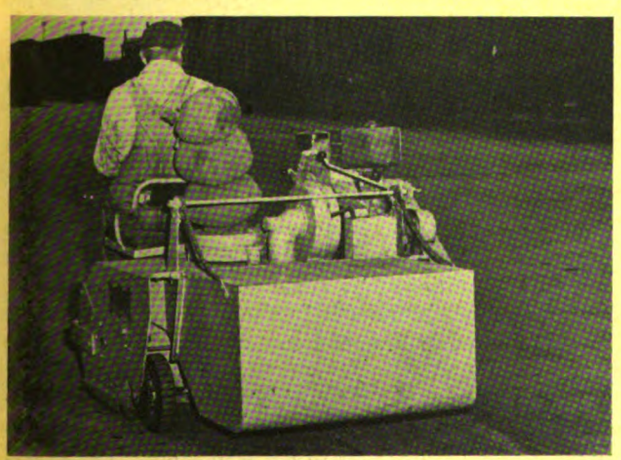
Highway movement of mounted wheel sets for emergency changes out on the road will be tried with a truck hauling a trailer. The wheel set will be raised and "snugged" into position by a jack against a pair of concave supports shaped to the tread contour. The lifting jack is built into the trailer and the chains which wrap around the axle are fastened to a mounting fixture on the end of the shaft.

To protect rip track areas by putting out small fires quickly before they become big ones, four-wheel fire fighting wagons are being installed at the larger points. These can be pulled along the concrete runway either by the workmen or by a shop truck. They extinguish the blaze either by fog nozzles or by dry extinguishers.

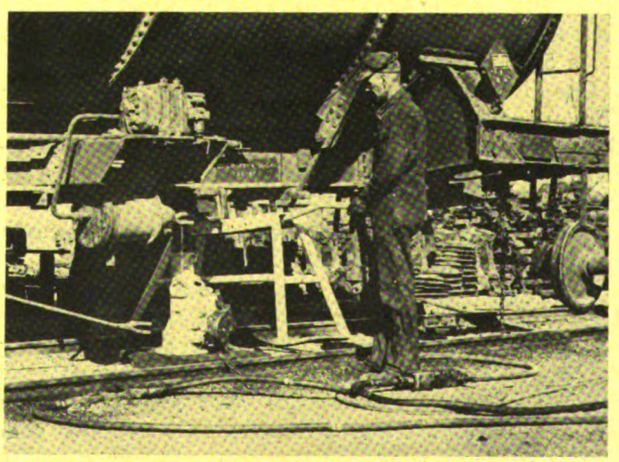
The wagons carry 275 gal. of water (a seven-minute supply), two CO_2 dry extinguishers, two axes, and two reels, each with 50 ft. of 1-in. hose. The wagons are charged with air for water delivery from one of the rip track outlets. Anti-freeze (calcium chloride or similar solution) is added to the water during the winter to permit storage outdoors.

The Frisco has also found it to be a worthwhile practice to remove the grease, oil and road dirt from the wheel plates on used mounted car wheels before turning journals. The cleaning takes about a minute a wheel and is done by a steam gun.

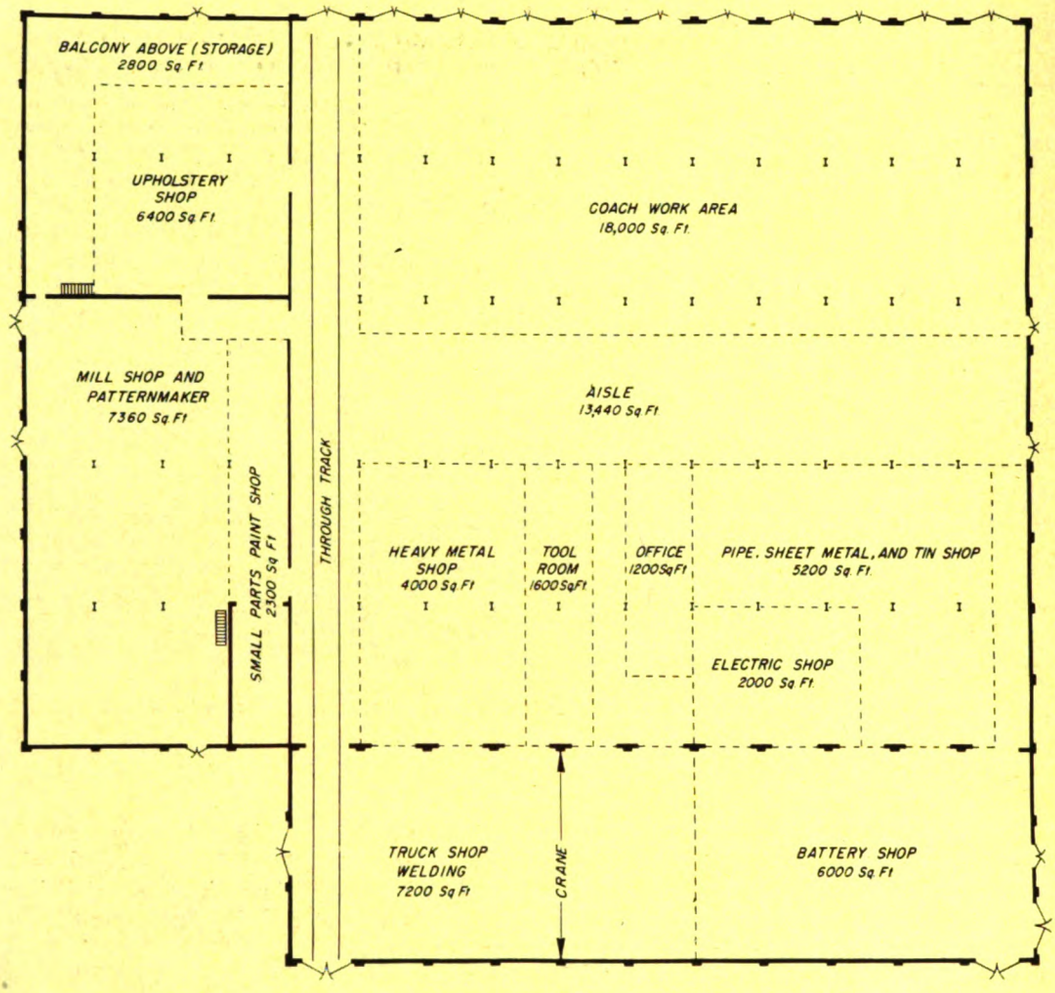
Two principal advantages result from removal of this accumulation: (1) elimination of fouled up cutting tools and burnishing rollers of axle lathes, which would otherwise be caused by this accumulation falling off while the journals were being turned; and (2) better inspection of the plates of the wheels for cracks or other defects.



Concreted rip tracks—which are installed at Springfield, St. Louis, Kansas City and Wichita—are kept clean by power sweepers



Welding handles on a conventional trestle makes it easy to carry about and simplifies putting it under the car



Two plans were studied to modernize coach repair facilities—one to change the present shop to look like this

Coach Needs Analyzed

Two plans were studied to improve coach repair facilities. Initially, both depended principally on the reduction of material handling for the improvement they would be expected to effect. A substantial revision of the present layout would reduce such handling by 48 per cent, while moving the coach repair operations to the former steam locomotive erecting shop would make for a 55% reduction.

One of the main factors in reducing the material handling requirements is the reduction in either plan of the area available for coach repairs. Revising the present shop would reduce this area to about half of what it is now. The alternative plan for taking over the former steam erecting shop would reduce the area for coach repairs somewhat less than this.

The reduction in coach repair area will result in the repair time to the average coach being reduced partially because the smaller area will reduce material handling requirements and consequently man-hours to complete the repair and partially because of other improvements in efficiency resulting from the modernization. A final gain that is expected is an improvement in the availability of the more modern equipment because of the lesser time that it will spend in the shop when due for repair.

Revising the layout of the present shop is the simpler job of the two plans. The principal change from the present layout is in the area to the right of the through track and below the aisle. This is now occupied by a series of tracks for coach work. These tracks would be eliminated in favor of the shop, tool room and office areas shown on the drawing.

With this plan one building and part of another where coach work is currently being done could be eliminated. All coach shop operations would be in one place, and all operations under any one foreman would be in the one area. The general foreman's office would be in the approximate center of the shop—resting on 40-in. stilts and completely glass enclosed to make the entire shop easily visible.

The upholstery area would be increased some 2½ times to permit a revision in present seat renovation practice. The new plan would be to have seats reconditioned in advance as this work is now often the operation that delays the car. The increased area can be used to store seats so reconditioned in advance. To keep a steadier load on the upholsterers, it is also planned to catch up on seat work when head-end cars are going through the shop.

The advantages of centralization of supervision, consolidation of work into fewer buildings and shop sizes proportional to work load would also apply to a second alternative—taking over part of a former steam shop. This plan would also offer some additional advantages

but at a cost of about half again as much as revising the present coach shop.

Moving into the old locomotive shop would eliminate four buildings (at least two more than the other plan), and it would bring under the one roof the air brake room and machine shop, which would be separate under the other plan.

Assembly Line Truck Work

The use of the locomotive shop would permit taking advantage of its crane facilities for better material handling. While the overhead traveling cranes could not be used for lifting the car body, the No. 1 crane (two of 10-ton capacity) would improve the efficiency of carrying the trucks to and from the repair area. It would also be useful to handle upholstery and storage items between the main floor and the balcony. The No. 2 crane would move heavier materials (actually the No. 2 crane is three cranes of 15-ton, 100-ton and 250-ton capacities).

The procedure intended to be used for removing trucks would be to raise the car on four jacks and roll both out toward the center aisle. The trucks would then be carried to and from the truck shop by the No. 1 crane. This would save pushing the truck from the shop to the transfer table and a move of the table. Truck overhaul operations will be on an assembly-line basis with three tracks planned for the work.

Other advantages of using the former steam locomotive shop are that it offers a potential of 25 tracks and a more compact arrangement for heavy repairs to diesel and coach bodies. Wreck damage work on diesels would continue to be done in the coach work area because this is equipped with tie-down rings to straighten bent frames.

Originally it was planned to move the traveling paint spray booth to tracks 1, 2 and 3. This idea was later changed after additional study however, as the move would be quite expensive to make and there would be no appreciable simplification of procedure. Movement of the car between the repair area and the painting area would require the use of the transfer table as it does now because the crane facilities are such that the car body could not be lifted between the two areas.

Where the coach shop has but 20-ft track centers and has supporting columns between the tracks, the locomotive shop has 22-ft centers and no obstructing columns. Further, none would have to be erected as the locomotive shop conversion would employ portable scaffolding.

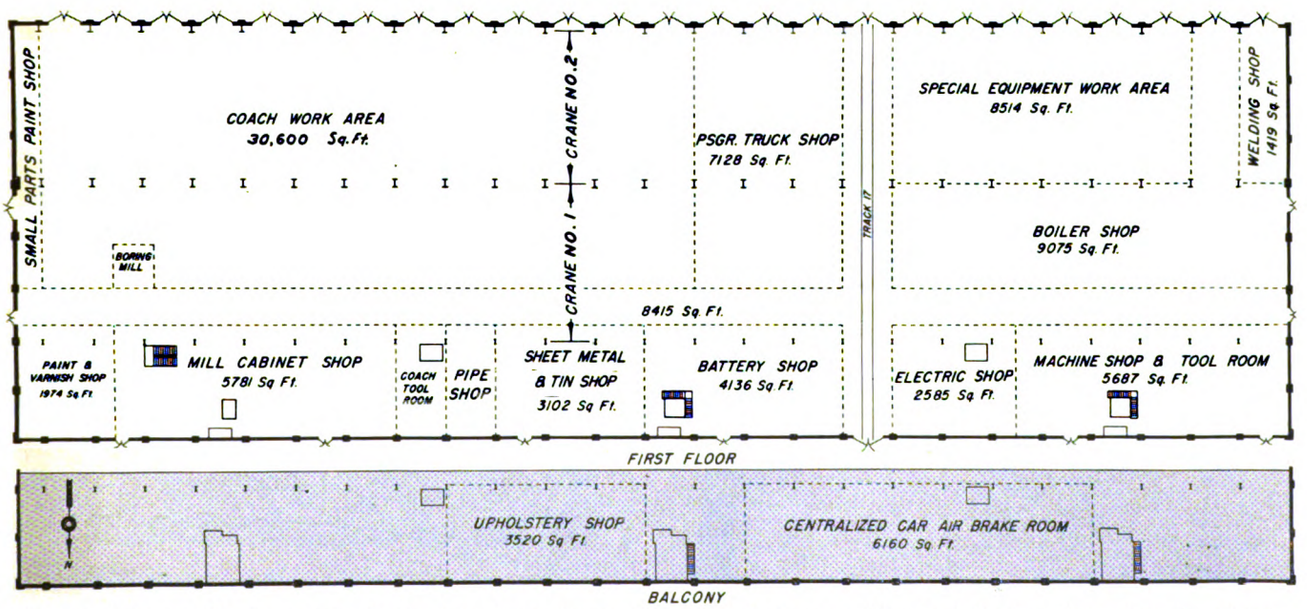
The locomotive shop is floored entirely with concrete whereas the coach shop has wooden planking for most of its floors. The locomotive shop also offers the shortest route to and from the blacksmith shop and the stores building.

The output of a shop under either plan would be four heavy and eight light repairs per month, which is sufficient to give Frisco passenger equipment a light repair every two years and a heavy repair every four years.

SPACE AVAILABLE FOR DIFFERENT OPERATIONS UNDER THE TWO COACH SHOP PLANS

Operation	Area by Revising Present Shop, sq ft	Area by taking over locomotive shop, sq ft
Coach Work	18,000	23,760
Truck Shop	7,200	7,128
Sheet Metal	5,200	4,136
Mill Work	7,360	5,781
Battery Shop	6,000	4,136
Electric Shop	2,000	2,585
Upholstery Shop	6,400	3,520
Heavy Metal Shop	4,000	9,075
Small Parts Painting	2,300	1,974
Carbody Painting	*	6,840
Air Brake Room	*	6,160
Machine Shop	*	5,687

* Would be done in another building



The second plan would take over the former steam locomotive erecting shop. It is the more elaborate of the two plans and would cost more, but would result in a more efficient operation

The Car Man's Role in Damage Prevention

In addition to its consulting role in supplying technical knowledge where needed to solve damage prevention problems, the car department plays an active part in selecting the right car for the lading. The selection is made by the mechanical inspector with the aid of a series of small car classification cards.

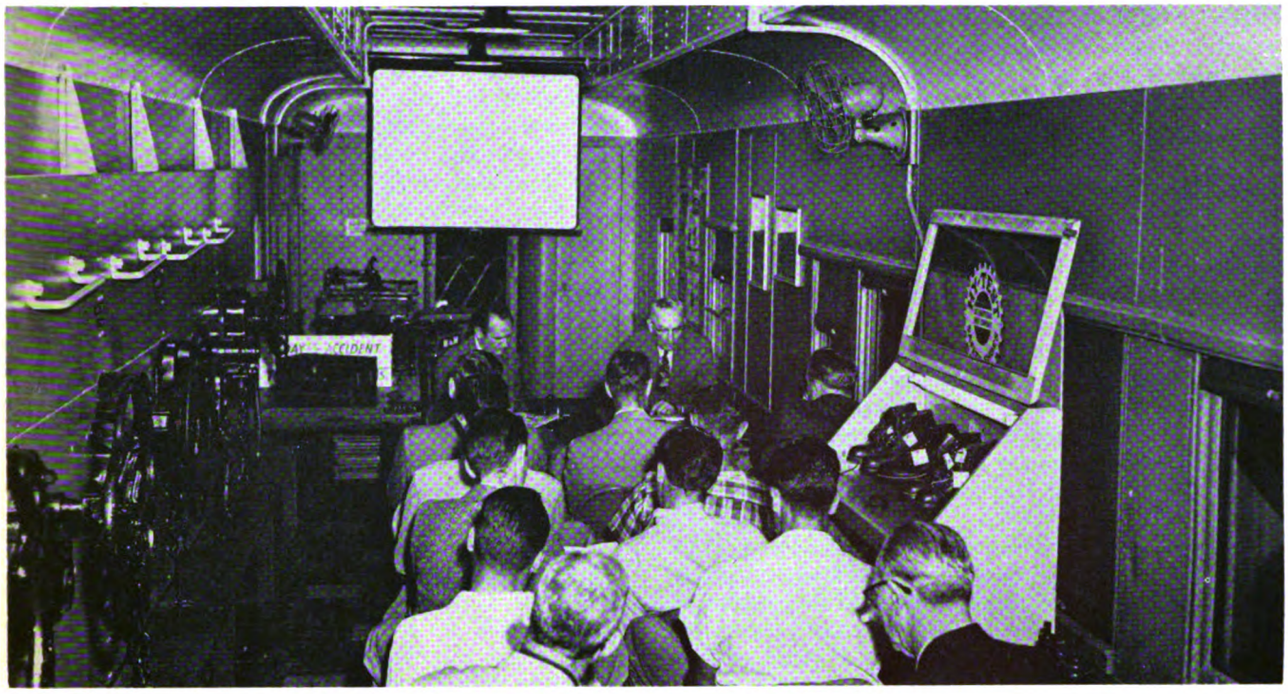
The card telling the commodity for which the car is suitable is applied by the mechanical inspector either in the classification yard or on the rip track. It stays with the car until it is unloaded, at which time the agent removes and files the card. If the lading carried in the car should later turn out to have been damaged as a result of a mechanical defect in the car, the card can be removed from the file to tell who erred in classifying the car.

Action taken when a car has been misclassified is essentially educational rather than punitive in nature for two reasons—(1) the work is often done under adverse conditions, such as darkness, cold, rain, etc., and (2) a tough policy would tempt an inspector to be ultra-conservative in grading cars as he would have everything to gain and nothing to lose. The final result would, of course, be that better cars than needed would be furnished for many loadings, and there would be a shortage of cars marked satisfactory for commodities requiring higher grade cars.

Two Classes Per Card

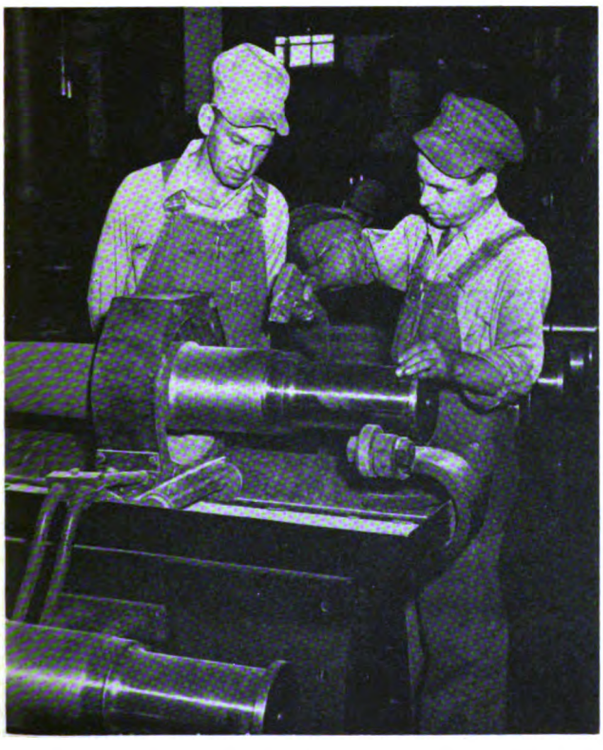
The cards used for classifying cars are a standard form 3 in. by 4 in. and most have one classification on one side and another on the reverse side. The printing is in black except for the classifying letter which is in green. In some cases there is a relationship between the two sides, as the *A* and *AA* for box cars. In others, the classification on one side may be for a different type car than that on the other side, as *D* and *E*.

Altogether there are six different card forms covering nine letter classifications. Four cards have letter classes on both sides. A fifth, marked *P* for pipes, logs, poles and piping, is marked on one side only. The sixth card is marked *F* on one side for lading not covered by one of the other cards and the name of the commodity is written in.



Training Its Men

The Frisco is training-minded and has programs tailored to various levels from apprentice to top management.



More than most roads, the Frisco sends men around to visit other shops to see first hand how jobs are being done instead of being told how by traveling instructors

Personnel training on the Frisco is carried on at all employee levels right up to a 90-day course at Harvard for top management. This course gives a thorough all-around training in traffic, finance, business administration and personnel relations, and is not departmental in any sense.

Outstanding prospects for future promotion to top management posts are sent to an intensive course at the American University in Washington, D. C. The course runs 9 hours a day for 30 days and is complete in transportation, including financing. It, like the longer Harvard course, is not departmental in any sense, although it is attended largely by departmental officers. Included in the curriculum are lectures by outside experts and four field trips to such points as Potomac yard, Washington airport, Washington terminal, the B&O shops in Baltimore, the Baltimore wharf and dock facilities and the headquarters of the I.C.C.

Mechanical department personnel also attend Dale Carnegie courses in public speaking and human relations along with members of other departments. These courses are held at different points on the Frisco and are given to groups of approximately 40 which comprise all levels of emloyment from laborer to vice-president. The course runs for 16 weeks and has one four-hour meeting each week. It is conducted on the employees' own time but the entire cost is financed by the railroad.

There are two diesel clubs composed of Frisco employees only, one at Tulsa and one at Springfield. These are run entirely by the members but the railroad does

help out with such things as providing special equipment (movies, projectors, data, etc.). The line also helps to get speakers and sometimes contributes toward minor expenditures. Only hourly rated men may hold office in these clubs which are open to shop men and road crews.

Apprenticeship Training

The Frisco has three types of apprenticeships—a 2-year special apprenticeship, a three-year helper apprenticeship and a four-year regular apprenticeship. Special apprentices must be between the ages of 20 and 26 and be engineering college graduates; regular apprentices must be between 16 and 24; helper apprentices are between 21 and 35 and must have served two years in their repective craft before hiring on as a helper apprentice. Currently there are 84 regular apprenticeships, 7 helper and 3 special apprentices. Helpers are no longer being upgraded.

When a regular apprentice is hired he is first taken on a tour through the shop where the work of the various crafts is explained and shown to him. At the conclusion of the tour a discussion is held with the prospect to find out what craft he would prefer and would be best qualified for. If hired, the regular apprentice serves eight periods of 130 eight-hour days. Helper apprentices serve six periods of 130 eight-hour days and special apprentices four periods of 130 eight-hour days. Regular and helper apprentices are hired by the master mechanic having jurisdiction.

Broad Special Apprentice Course

Special apprentices are screened more thoroughly and are hired by the chief mechanical officer. A correspondence course is encouraged but not required from apprentices. At times the apprentices also attend some night courses in state schools that are helpful to their craft. The Frisco is currently setting up a blueprint reading course to be taught by the assistant mechanical engineer at which mechanics will also be encouraged to attend.

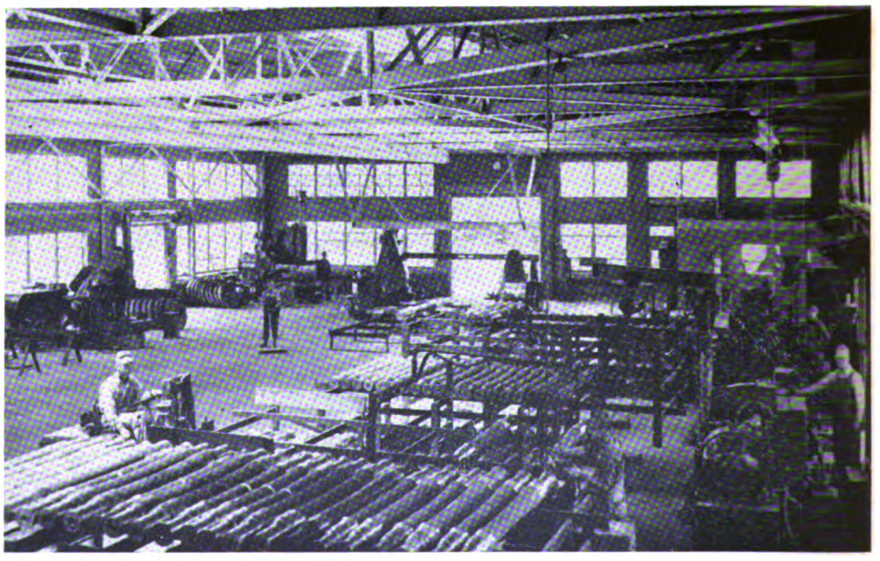
The special apprentice does the work of all crafts during his two-year period and then gets the choice of any craft at which he works one day to establish his seniority as a journeyman. The special apprentice then spends 60 days divided among other departments (traffic, transportation, engineering, signalling, personnel and accounting) to give him a rounded viewpoint of the overall railroad operation. Following this he normally has four choices of where to start his career—the car department, the diesel department, the mechanical or the electrical engineer's staff.

One aspect of personnel training which distinguishes the program of the Frisco mechanical department somewhat from that followed by most roads is the value placed on visiting shops. More than on most roads, men from one shop get a chance to visit another, particularly the main shop at Springfield. By doing this instead of sending instructors around, the men can see at first hand how jobs are bing done at points other than where they are stationed.

This procedure has also been found helpful in more respects than just teaching the men how to do given jobs. For example, if a supervisor is not keeping his shop as clean as is thought he should be, he may be sent to another shop where good housekeeping does prevail to show him what can and is being done.

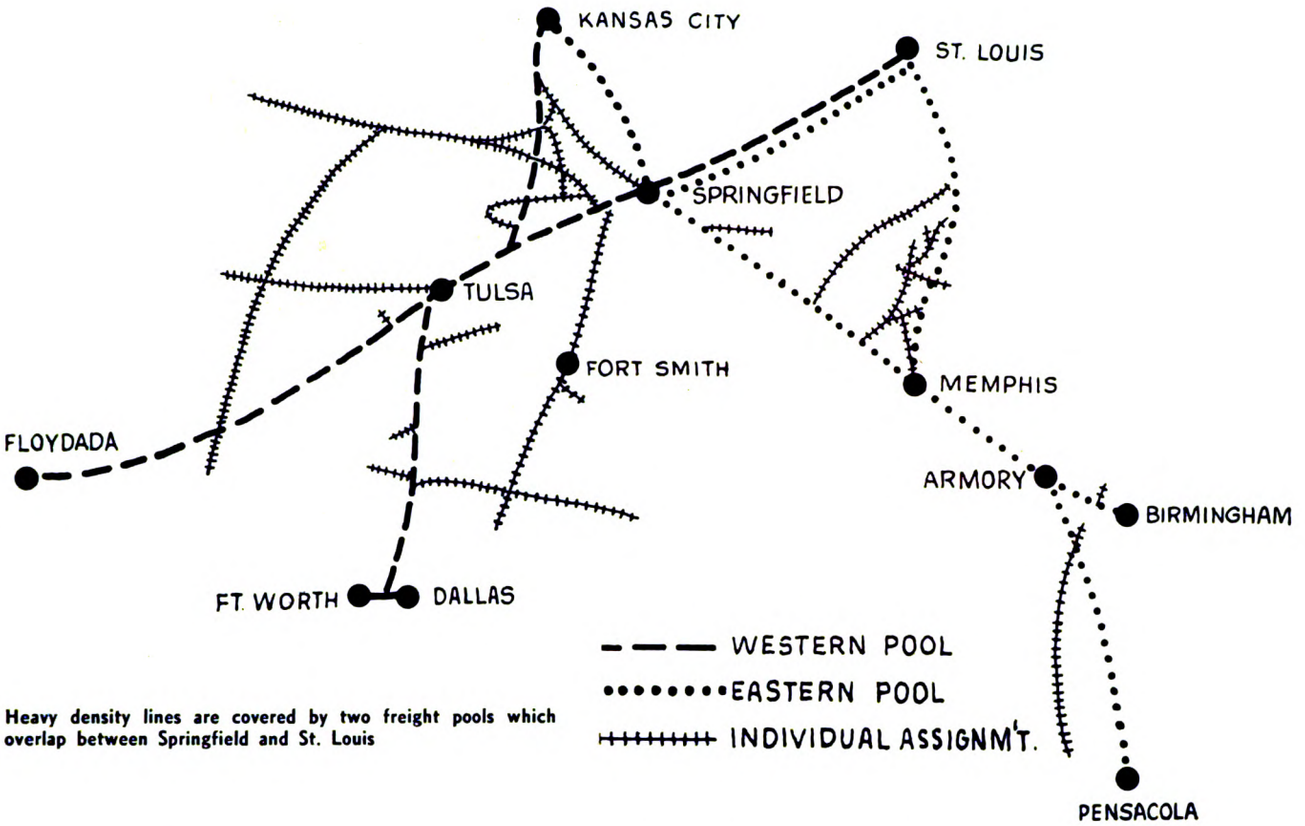
This on-the-spot observation of work is supplemented by general training with an instruction car that visits major points. Instruction on this car is given both by Frisco men and by representatives of the locomotive builders. The program of sending men to schools at the locomotive builder's plant has just about been completed as most supervisors have already completed one or more of these. These men are thus in a position to impart their knowledge to the men under and around them, and the Frisco prefers to train their men in their own shops anyway.

To prepare men to solve problems that are still largely in the future, outside schools are still employed. For example, three diesel supervisors are currently attending a school for freight car mechanical refrigeration. What they learn at this school, plus literature from it, will be used to teach mechanics and apprentices who will handle this equipment.



These trips can also be used for other purposes—such as to hint at better housekeeping by having a man visit an unusually neat shop like the above

Facilities and Operating Pools



Heavy density lines are covered by two freight pools which overlap between Springfield and St. Louis

Being an X-shaped railroad, the Frisco centers its operations and maintenance about Springfield. All units get heavy overhauls, and nearly half are maintained there, including the 108 assigned to the two freight pools.

All passenger power (23 road-type units and 12 road-switchers) is assigned to pools, with half maintained at St. Louis and half at Tulsa.

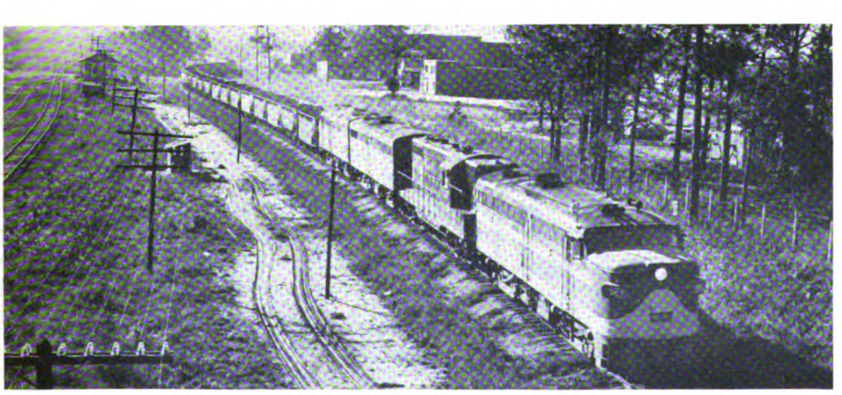
The actual number of units in the two precision freight pools will vary somewhat according to traffic volume. In general, trains handled by pool locomotives are the more important time freights and are overpowered, with the number of units assigned to a given size train determined by ability to make the schedule rather than by tonnage rating.

Thus, if an unexpected heavy job is required on a unit of a pool locomotive, it can be cut out and the locomotive run one unit short without serious effect on the schedule. Normally a spare unit would be available to put in its place or tonnage would be reduced.

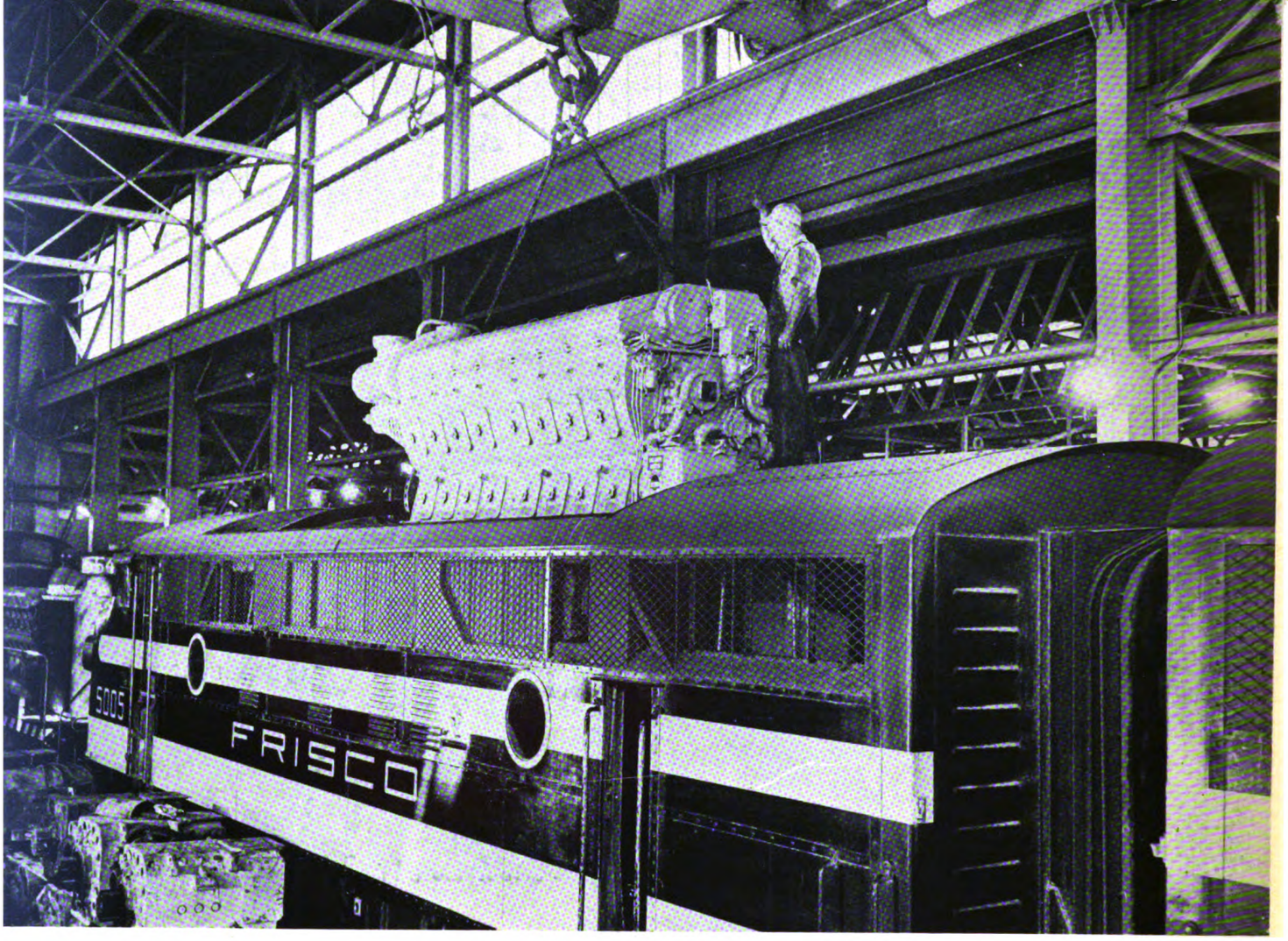
Approximately 170 road and general-purpose type units are not in the precision freight pools. These are considered extra power and are shifted around to meet variations in local traffic volumes. The movements are made by the transportation department after conferring with the mechanical department to coordinate train assignments with scheduled maintenance needs.

This extra power is not centrally assigned as on some roads. Except for the movement of power between divisions and into maintenance terminals for mileage scheduled inspection, assignments to particular runs within a district are made locally.

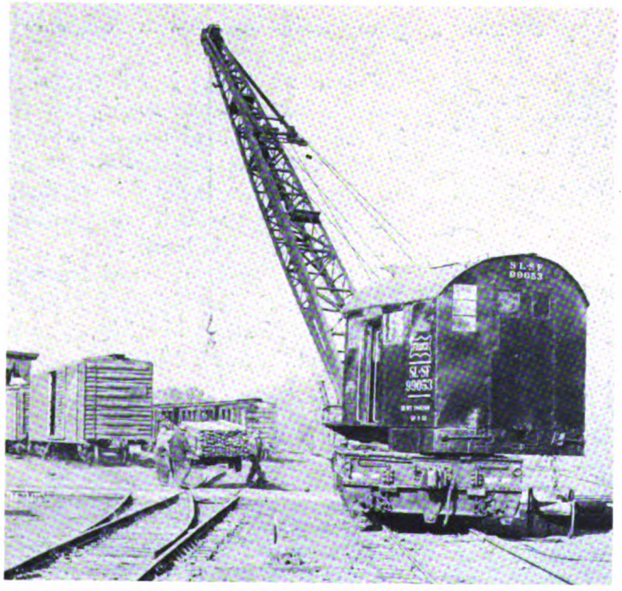
Principal mileage maintenance points are: Springfield (179 units), Tulsa (76), Fort Smith (54), Amory (58), and St. Louis (50).



Units are cut in and out of locomotives to match train tonnage with no attempt made to keep given combinations of units together nor to keep road units segregated from all purpose units



General Diesel Policy—



Cranes from 15 to 160 tons are being dieselized. Savings on fuel are a dollar an hour on 30-ton models like the one above

What The Frisco Thinks About—

- Frequency of heavy repairs
- Economics of unit exchange
- Flashover prevention
- Relationship of truck and engine repairs
- Inspection methods
- Personnel training
- Remedying road failures

While the Frisco does not have any diesel practices which might be termed radically different from other roads, it does follow a number of ideas which vary at least in degree from what most lines are doing. One major group of these ideas concerns unit exchange. The Frisco employs this practice more extensively than most roads of its size especially on large items of electrical equipment and it plans to continue to do so in the future.

Why the Frisco uses unit exchange rather extensively

is exemplified by the thinking on traction motors. They follow a thorough program of servicing and light maintenance, but get all complete overhaul through the medium of unit exchange. The Frisco has four main reasons for this practice: (1) It would cost about $585,000 for a traction motor shop capable of meeting a peak need up to 25 traction motor and about six main generator overhauls per month although average needs would only be about 40% of this; (2) it would require an inventory of about 35 more traction motors at $6,000 each; (3) traction motors would only be maintained in kind and not upgraded as is currently done by the manufacturer in unit exchange; (4) and finally the line feels that present operation is satisfactory with less than 100 unit exchange motors required in an average year and about 200 in peak years of major repairs.

Motor Mileage and Cost

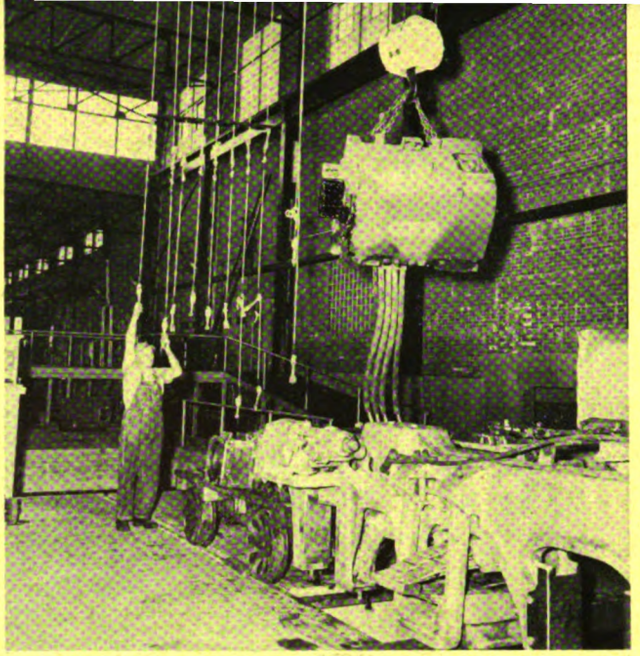
Traction motors are sent for unit exchange after six years on switchers and 600,000 miles on freight and passenger units. In general, bearings are the limiting factor on passenger motor life, insulation and bearings on freight traction motors.

A study is currently being conducted to determine whether it would be economical to increase the exchange mileage on passenger traction motors to 750,000 miles. The test is being conducted by gradually increasing the motor mileage in small increments to see how far this mileage can be extended before either an appreciable number of bearings might be expected to fail or where perhaps insulation would limit the mileage in passenger service as it now does in freight service. The chief consideration in the study is to see that the extra 10 to 25 per cent of mileage does not deteriorate the insulation to the point where it cannot be saved and thereby approximately triple the normal $475 cost of unit exchange to the $1,425 it would cost for a rewind.

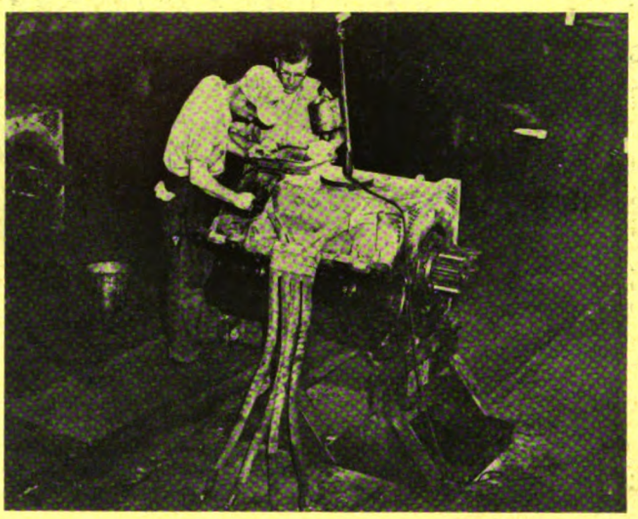
Truck and traction motor repair periods are completely independent of engine, body and auxiliary repairs. Truck and traction motor work is scheduled on a mileage basis to coincide with wheel turnings. This averages slightly over 87,000 miles on freight units, and 91,000 miles on passenger units. At this time, the traction motors are blown out and thoroughly cleaned, with the commutator checked by dial indicator and jig stoned if necessary. Before leaving the shop and being returned to service it must run within .001 inch out of round.

The risers have any old paint removed by sanding and are painted with a fast drying insulating enamel. The bearings are checked with a listening rod while driven by a welder at three different speeds—200, 1,000 and 1,800 rpm. If the bearings are considered unsatisfactory for further service, and the motor has over 400,000 miles on it, it is sent for unit exchange. If it has less than 400,000 miles, the Frisco puts in new armature bearings. The new type non-asphaltic base greases, such as Sinclair Jet Lube, Conoco Cogrease, and Texaco Geartac RR, are used in all traction motor gear cases, both the new tight-type gear cases and the original style.

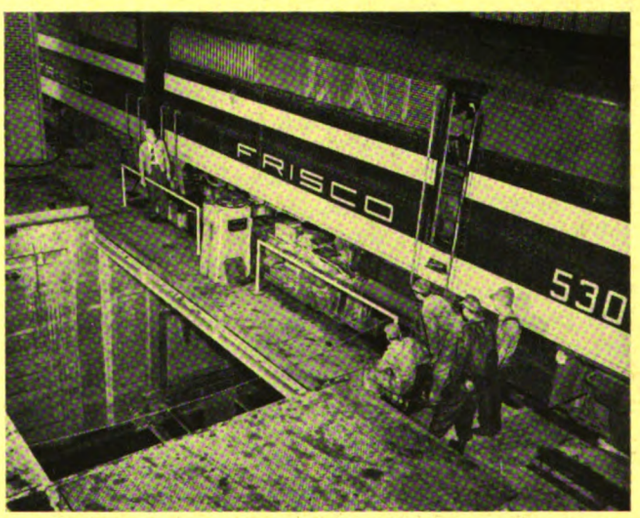
In between these light overhauls given to traction motors each time the truck requires work, the motors are blown out and a complete visual inspection is made. This is done every 5,000 miles on road power and every month on switchers.



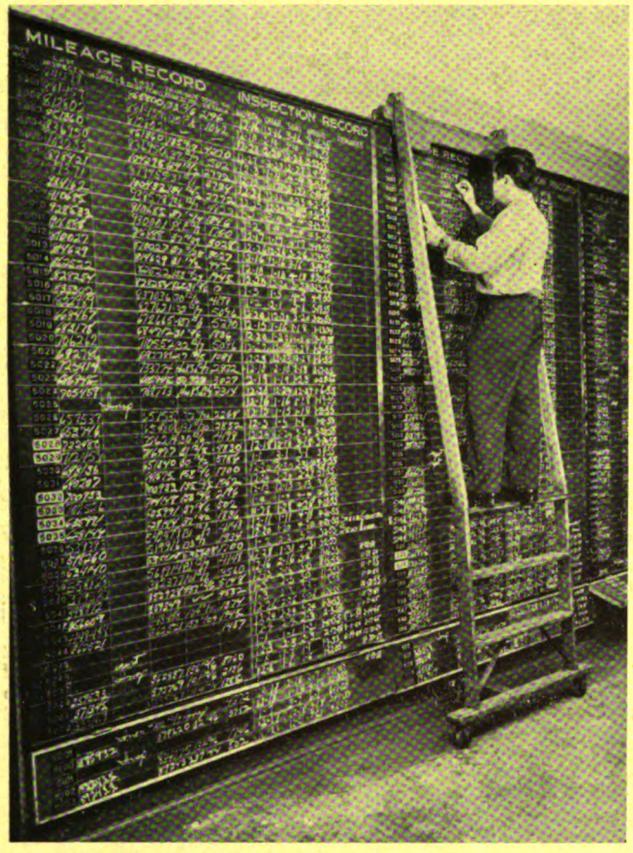
While traction motor maintenance is closely coordinated with truck maintenance and largely dependent on wheel work requirements, neither is correlated with engine repair requirements



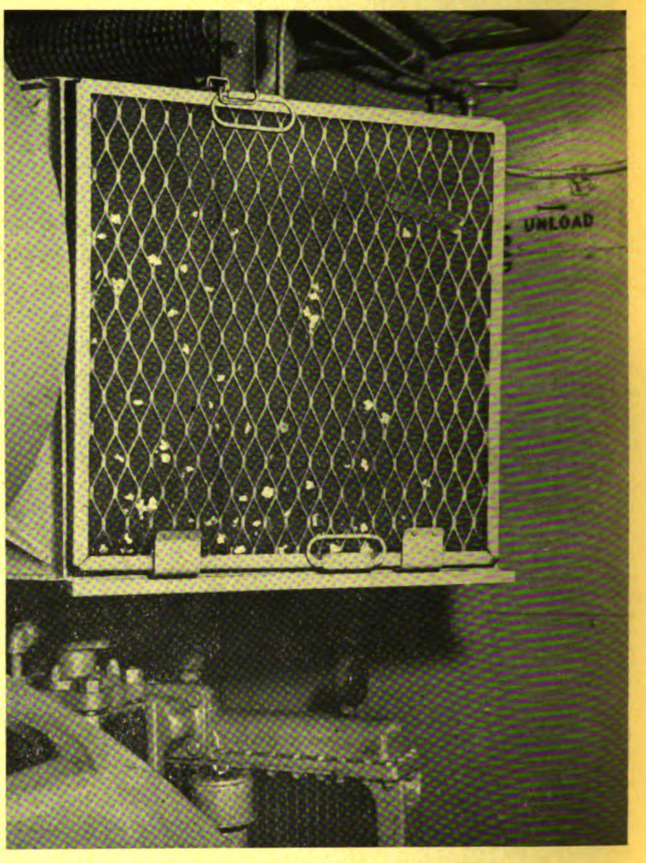
Every time wheels are changed out (unless at very low mileage from flat spots or other defect) the traction motors receive a complete inspection and minor work as necessary to bring them to new motor tolerance



Entire freight trucks rather than individual wheel sets are normally changed out at Springfield to simplify keeping wheel sizes matched The same is true of passenger trucks at St. Louis and Tulsa. At other points only the defective pair is exchanged on freight and switch power as the other practice would require too many spare trucks at the smaller points



A diesel records department relieves mechanical supervision of all clerical work involved in keeping track of mileage and inspection work due



Rather than depend on getting the dirt out of EMD main generators by corn cob blast or other means, the Frisco developed a filter arrangement to catch the oil vapors and keep dirt that does enter dry

Freight trucks are rebuilt about every 87,000 miles (which is the average freight wheel life). Normally by this mileage, at least one pair of wheels needs replacement.

Generally as the one pair comes due for replacement, the second is close to needing it. A similar situation prevails on passenger trucks. When one pair of wheels needs replacement at an average of 91,000 miles, the second and third are not far behind. Therefore, the Frisco's usual practice is to change out the entire truck at whatever mileage the first pair of wheels needs attention, and to do it at the point at which the unit is maintained—Springfield for freight units, St. Louis or Tulsa for passenger power. This practice also fits in well with the traction motor maintenance program.

When changed out, necessary pins, bushings and wear plates are renewed and the truck is kept for assignment to whatever unit next needs one; no plan is followed to keep any one set of trucks with any one unit. There are three spare trucks at Springfield for each major class of unit to provide different size wheels. Other major maintenance points have one spare truck.

Flashover Protection

Main generators are sent out for unit exchange at approximately twice the mileage of traction motors. This averages a million miles on freight units, 1.5 million miles in passenger service and every 12 years on switches.

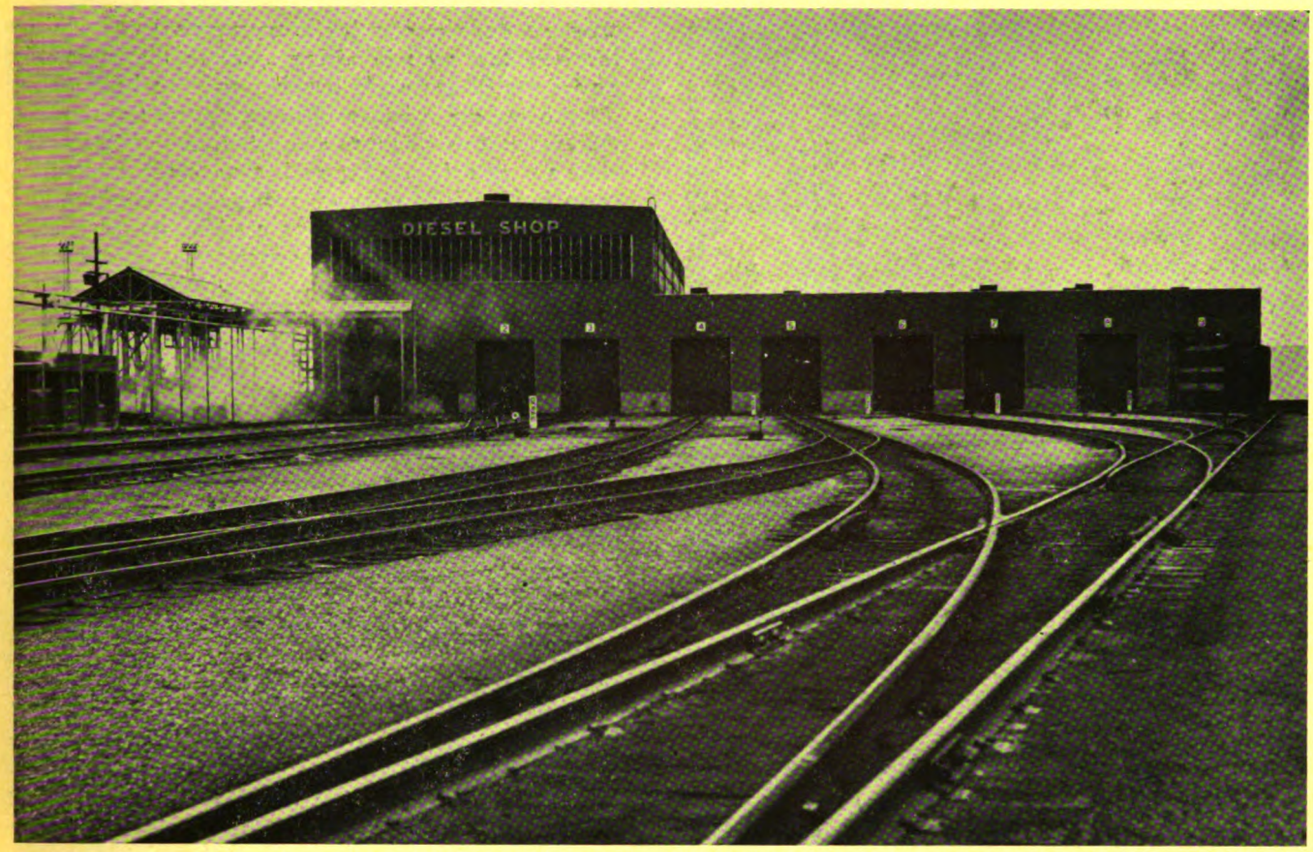
In between these basic overhauls, main generators get treatment similar to that accorded traction motors, with the main exception being that they are allowed to get .004 inches out-of-round before stoning.

The Frisco places a good deal of emphasis on keeping generators clean, feeling that most flashovers occur from a combination of a dirty generator and a bad wheel slip, or from such specific causes as having a leaky water hose over the main generator or having the steam generator blowdown line too close to a traction motor, causing it, and the generator in turn, to flash over whenever the steam generator was blown down.

Corn cob blast is not employed—partially because it is too hard to clean up after and partially because the generators are kept continually clean by the introduction of an air filter in the intake air. Peach pits and aluminum oxide were also tried for this purpose but the results were considered unsuccessful.

Electrical Responsibilities

On the Frisco the electrical engineering department is primarily a service group for the mechanical and the engineering department, with the majority of its work for the latter. It serves essentially to solve special problems in the electrical field when called upon to do so by the department directly responsible for the item involved. The electrical engineer does, however, have line responsibility for air conditioning and the lighting of passenger cars and for a few minor items such as water coolers and the a-c generators for radio equipment.



For heavy repairs, new structures are preferred to converting former steam shops. While the cost is higher and the space provided is less, the Frisco thinks that the minimum space gives a neater shop and more productivity as less time is spent moving men and materials about

The present set-up grew out of the fact that the first diesel superintendent was a former electrical engineer. He was therefore his own expert in electrical matters and did not have to refer to the electrical engineering department to solve electrical problems. As a result it was not thought necessary to give the electrical engineer any great jurisdiction over the diesel field.

The electrical engineering department also overlaps in authority to some extent some of the other special departments, such as the supervisor of tools and special equipment. For example the conversion of a machine would be under this supervisor but whether to buy a new motor or to use an old one would be decided by the electrical engineer. Actually the Frisco has found that in making such machinery conversion about 80 per cent of the motors needed are new ones. Frequently this is because the old motor is the wrong horsepower—either too much or too little. Even where the old motor has excessive horsepower it is not considered wise generally to use it because of the larger controls and wiring required, and because of the adverse effect on the power factor.

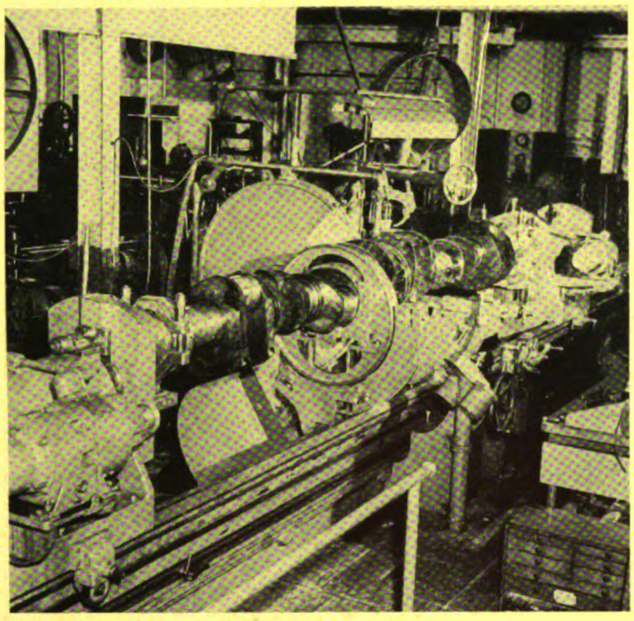
Operation Effects Inspection

For routine servicing between overhauls, the Frisco follows the standard builders recommendations for mileage inspection and repairs at 5, 10, 30 and 60,000 miles. When such routine comes due, no attempt is made to have different type inspections due the different units of a locomotive to keep the total volume of work relatively constant from day to day. Neither is an attempt made to have the same type mileage inspection due on each unit. Either practice would be too complicated with the Frisco type operation where units are cut in and out of locomotives as required by the tonnage and determined by the dispatcher, with no effort devoted to keeping the same groups of units together. All units could be due for a 60,000-mile inspection, all for a 5,000-mile, or any combination of these and the 10 and 30,000-mile inspections.

All Electro-Motive road freight and road switch power have 62:15 gear ratios while all Alco units of these two types have 74:10 ratios which give both makes a top speed of 65 mph and similar traction characteristics so that the two can be run together. These two makes are mixed together indiscriminately as are different models of each make and road switchers with road freight units. In the latter case, however, only one road switcher is allowed in a mixed consist (with one exception) to eliminate jack-knifing and it is always the second unit. No. 6 BL brake equipment on road switchers has also been modified to permit its operation with the 24 RL which is on all road freight power.

Allowable combinations (using the symbol F for road units and RS for road switchers) of road freight and road switcher units are:

F RS RS
F F RS
F RS F
F RS F F
F RS F F F



Similar to the practice of employing unit exchange for major overhauls on traction motors and main generators is the Frisco policy of employing outside contractors for some specialized mechanical jobs like crankshaft grinding

Also up to 3 road-switchers by themselves.

There are no other restrictions on the mixing of freight-geared units. One recent dispatchment, for example, comprised an F7, an Alco road-switcher, an F3, an Alco B and an Alco A unit.

Few Repairs by Engine Crews

In training enginemen how to handle failures out on the road, primary emphasis is placed on teaching them to give a clear description of the failure via train radio to an experienced maintenance man who can better diagnose the cause of the trouble and give step-by-step instructions on remedying it. Maintenance people are normally far more experienced in knowing how to remedy failures than an engineman could be trained to be. The use of these radio descriptions also helps the shop by giving a more accurate and detailed report. This helps speed repair of partial failures when they limp in, and to have proper equipment and parts on hand for repairing certain failures which are best not attempted while the units are on the road.

What Kind of Shops?

It is always a question whether it is better policy to convert an existing structure in sound condition for diesel maintenance or whether it is better to build an entirely new shop which can be laid out exactly as desired. Converting an old steam shop is normally much cheaper and provides more floor area and crane facilities although it is usually more expensive to heat and to maintain. Converting an old shop further avoids the congestion that almost universally occurs when a railroad is limited by today's high construction cost in the size of the building they can afford to build entirely new.

Though mindful of these advantages of conversion, the Frisco chose to follow the policy of building new shop structures (particularly for heavy repairs) because the line feels that by minimizing space to that absolutely required to do the work, the shop must be kept neater; (2) productivity is increased because much less time and effort is spent moving men and materials about; and (3) while a large amount of space is available in a converted steam facility, it is often of a shape that does not lend itself well to diesel needs. For a while, however, some heavy repair operations to components were handled in an abandoned steam erecting shop. This procedure was not considered economical, and all diesel work except frame and body straightening is now done in the diesel shop.

At outlying points there was the added reason that most existing structures were not in sufficiently sound shape to justify retaining. The more modern roundhouses, those with brick walls and concrete floors, have, however, been converted to diesel work at larger points where facilities had to be retained. At smaller points where it was possible to dispense with the facility, abandoned steam roundhouses, shops and maintenance facilities were torn down and the area opened for industrial development.

Local and Top Supervisory Relations

Relations between top management and supervisors at different points are aided by a semi-annual meeting between the chief mechanical officer and a group of 12 foremen from different points on the line. These foremen are representatives of the foremen's organization. The foremen get together by themselves at Springfield in the morning and with the CMO in the afternoon. These meetings give each supervisor on the railroad, either through his own attendance or through another who is representing him and knows of his problem, a chance to air these problems and discuss them with management. A foreman at one point gets a chance to learn the problems of other foremen at other points and how they were solved. Through these meetings the CMO also learns at first hand what problems are confronting supervisors.

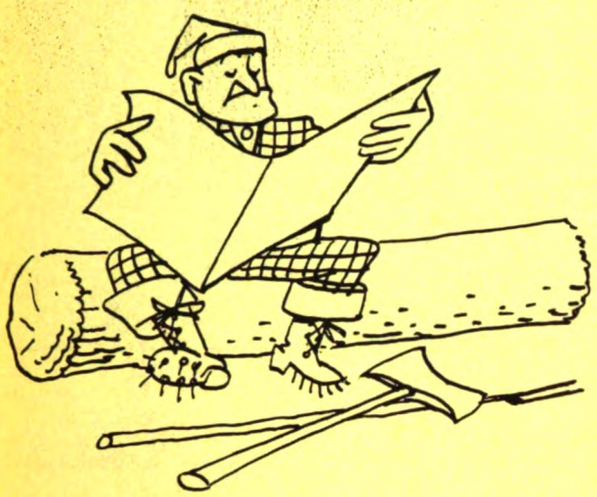
The mechanical department is building up a committee of three technical men with varied educational backgrounds and experience to make special studies of problems ranging from flashovers to optimum engine life between overhauls. This committee will also assist shop men and others in taking the rough edges off ideas that they originate.

A book of recommended diesel practice is being compiled to outline wear limits for principal parts and all steps to be followed in repairing or renewing such parts. This diesel instruction book will substitute for the present practice of providing the workmen with this information through manufacturers inspection books modified as found desirable by experience on the railroad.

Employee Morale

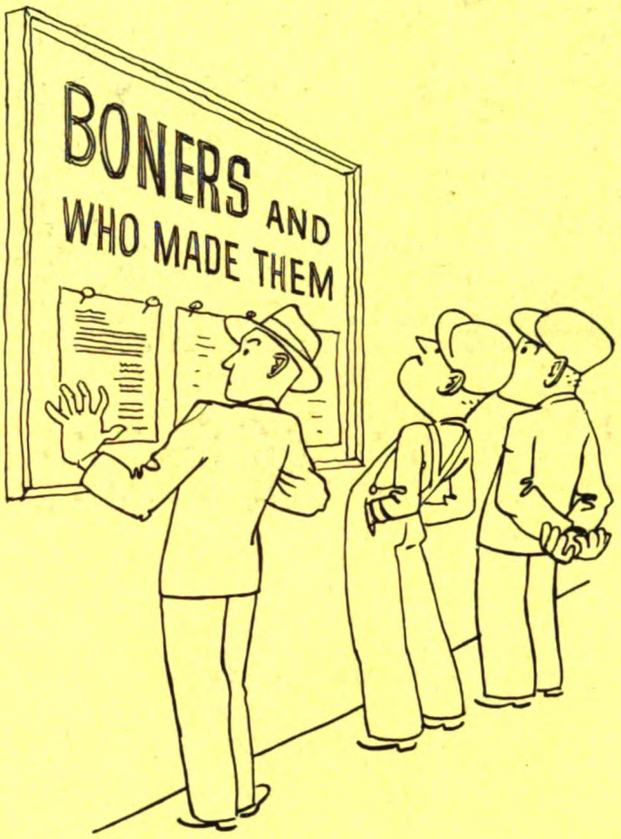
Frisco employees appear to like their jobs and their railroad. This is indicated not only by the general attitude which one sees in Frisco shops, but by the interest the men have in their jobs as shown through the amount of original thinking that the employees do in devising better means of handling their jobs. Gadgets and all kinds of ideas developed by the men to help them in their work are found in greater-than-average abundance in Frisco shops.

Novel Aid To Diesel Operation



1 Because everybody likes to read about what is happening to others . . .

3 The Frisco puts out a series of diesel bulletins describing failures but not saying where they occurred or who was responsible.



2 But nobody wants to be embarrassed by having his name attached to a mistake . . .

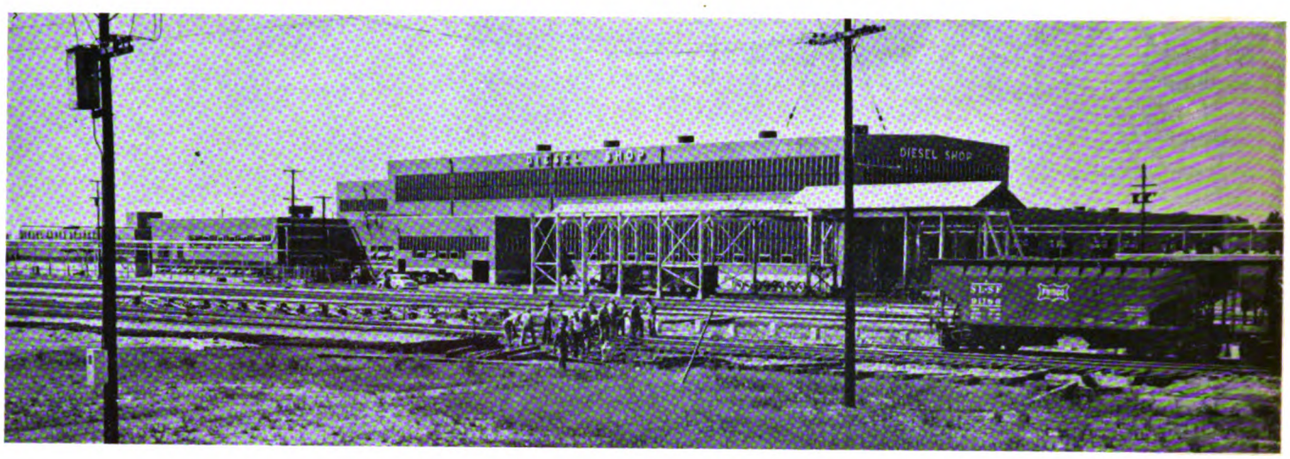
FUTURE BREAKDOWNS ARE REDUCED by acquainting mechanical and operating personnel with troubles that have occurred and why through a series of diesel bulletins issued from time to time. The bulletins are written by the maintenance department in an informal and even humorous style with such catchy titles as "How to Take the DIE out of Diesel."

These notes are normally divided into three sections—(1) what happened, (2) the cause, and (3) the lesson to be learned. They all deal with actual happenings on the Frisco, but in no case do they give the locomotive number, location or names of personnel involved. Thus the bulletins can play to the natural reader interest in news about other people, what happened, and how it might have been prevented, without embarrassing those actually involved or holding them up as examples of wrong-doing.

The study that goes into preparing these diesel bulletins has a secondary benefit. It permits failures to be grouped and studied. From such a study it was learned that flashovers on the Frisco occurred most while going down grade—probably due to the voltage build-up following the temporary reduction in load.

Gathering the information for the bulletins has also been helpful in providing data to solve problems. One example is a remedy for flashovers on the Electro-Motive units which has since been rather widely adopted. The problem resulted from oil vapor getting on the armature and commutator, making the dirt stick more firmly and reducing insulation values. Placing a dry and unoiled standard car body filter in front on the generator fan to catch most of the oil vapor kept the dirt that does accumulate dry and easy to blow off. The filters are replaced every 5,000 miles during which time they pick up an average of 5 ounces of oil and five of dirt.

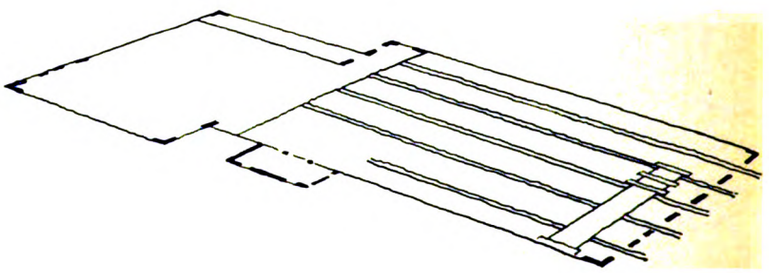
Before using this filter it was necessary to clean out the interior of the generator thoroughly at least every other annual. Since using the filters and blowing out the generator at 5,000-mile intervals, the need for the thorough interior cleaning at annuals has been virtually eliminated.



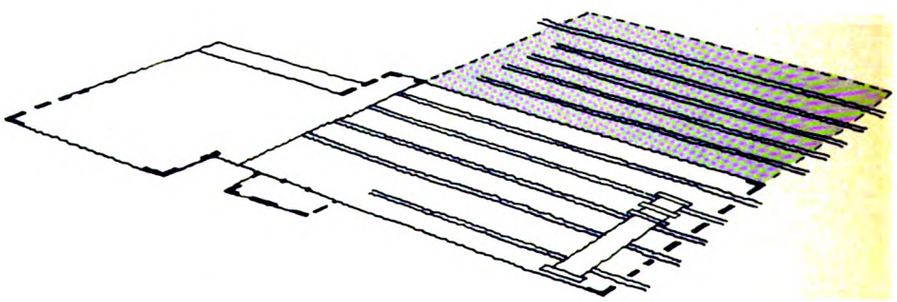
Springfield Diesel Shop

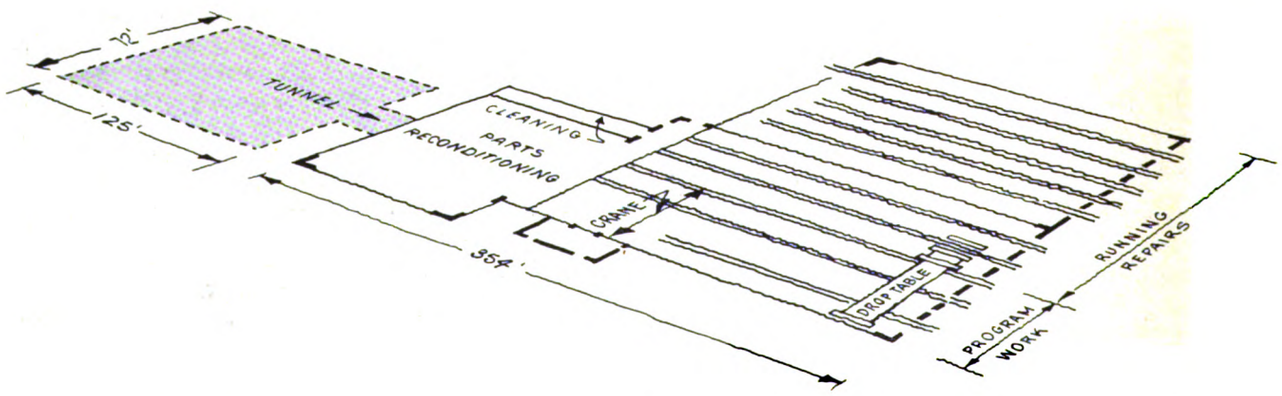
1—How It Grew With The Repair Load

1950—The original diesel shop was completed when the Frisco had 276 units. It included space for running and for heavy repairs with all stores under the same roof



1952—Two years later the fleet had grown to 407 units and four tracks were added mainly for running repairs and mileage maintenance





1953—A year later more space was needed to handle the growing load of heavy repairs. Building a new structure for stores and connecting it to the shop by tunnel at the basement level and by radiantly heated platform at the first floor level released 7,200 square feet for parts repair work in the diesel shop

By one conventional and one unique method of expansion, the Frisco has succeeded in approximately doubling the capacity of its major diesel shop without interfering with the original work plan or appreciably increasing material handling requirements.

The initial expansion by adding four tracks took care of the increased running repair requirements when the diesel fleet first began to grow but was relatively new. The second expansion—to take care of the increased heavy repair load—was more complicated, and it was made possible by the original design of the shop building.

When the shop building was first completed, everything necessary for the maintenance of the locomotives, including the stores department area, was included under the one roof. The Frisco took advantage of this feature when the need occurred to expand the parts repair area, and did it in a way that retained most of the advantages of having the stores in the shop building.

The solution consisted of erecting a new stores building 20 ft away from the blind end of the shop. The basements of the two buildings are connected by tunnel and the first floors by a radiant-heated platform to permit all-weather safe passage. Heavy items such as traction motors and generators are stored in the basement and can be delivered by fork truck directly to the point of use. Lighter materials are stored on the main floor on steel shelves.

Employees Don't Miss Windows

The building is windowless except in the corner where the storekeeper's office is located. Fluorescent lighting throughout and forced ventilation make windows unnecessary, and the employees do not seem to miss them.

The storage area released on the first floor (60 ft by 80 ft) is now a reconditioning room for parts which were previously overhauled in the engine repair room—air compressors, air brakes, injectors, speed recorders, etc. The air brake room that was at one end of the cleaning area was moved to larger quarters. The partition between the cleaning room and the old air brake room was knocked out and the cleaning area extended.

Only One Through Track

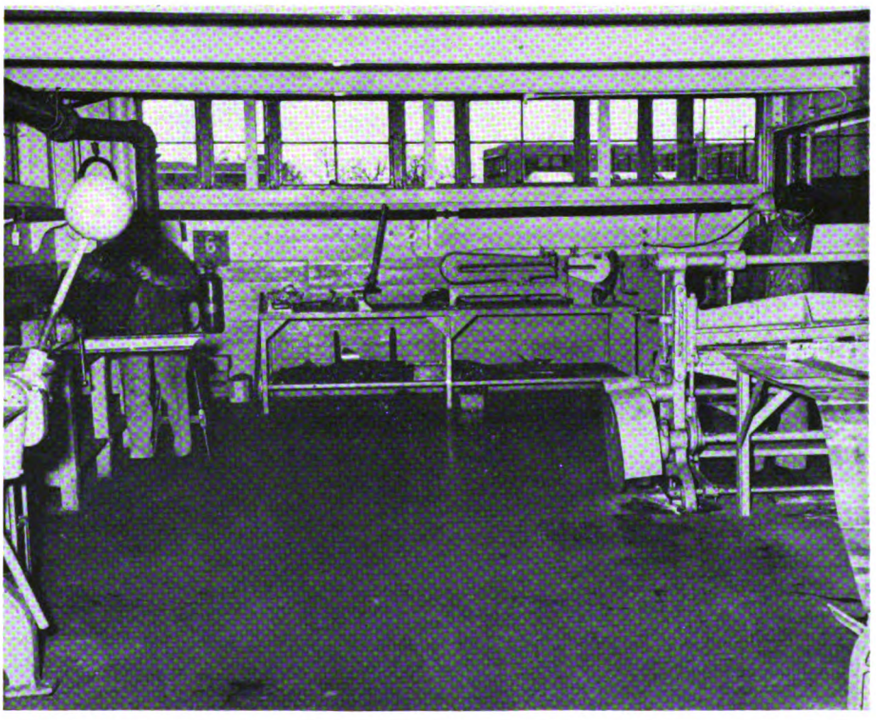
The present shop has nine tracks, 8 of which are approximately 215 ft long to accommodate four-unit diesels. The remaining track is 105 ft long and used mainly for switching power. All but track 2 have a full length pit. Track 4-9 have platforms on both sides, track 3 on the north side only. Tracks 1 and 2 have no platforms as they are in the dead work area.

Track 9 is the only through track. It is used for spotting the scrap car, which can thus be moved in and out either end without interfering with shop operations. In the original shop building before the 4-track extension was added, track 5 was the through track. When the extension was added, however, the west end of this track was walled off and the rolling doors moved to the track 9 location. The Frisco did not feel that any particular purpose would be served by an additional through track as eight of the nine tracks are long enough to accommodate four-unit locomotives.

The shop is built on three levels, basement, ground and first floor. The ground level is the track level while the first floor level is that of the top of the platform.

Most of the shop is on the first floor level. The only appreciable area at ground level is that surrounding tracks 1 and 2. It is served by a 30-ton traveling crane. Roofs are removed in this area, and trucks, engines and main generators changed out.

The basement includes a pipe and sheet metal shop, a radiator shop, locker rooms, oil storage, an electrical shop and a machine shop.



Taking over the basement stores area permitted moving the electric shop to larger quarters and converting the area it occupied into a shop for pipe and sheet metal work

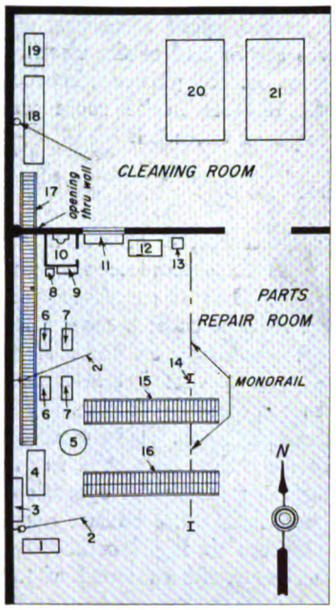
Springfield Diesel Shop

2—Layout and Operation

While the Springfield diesel shop is laid out in accordance with the usual pattern for facility of its type and size, it does have two features that distinguish it from other shops. The first is an extensive outdoor crane facility that extends far enough across the entrance end of the building for convenient transfer from the indoor traveling crane. It has two branches. One leads to the scrap car; the other covers the lye vat.

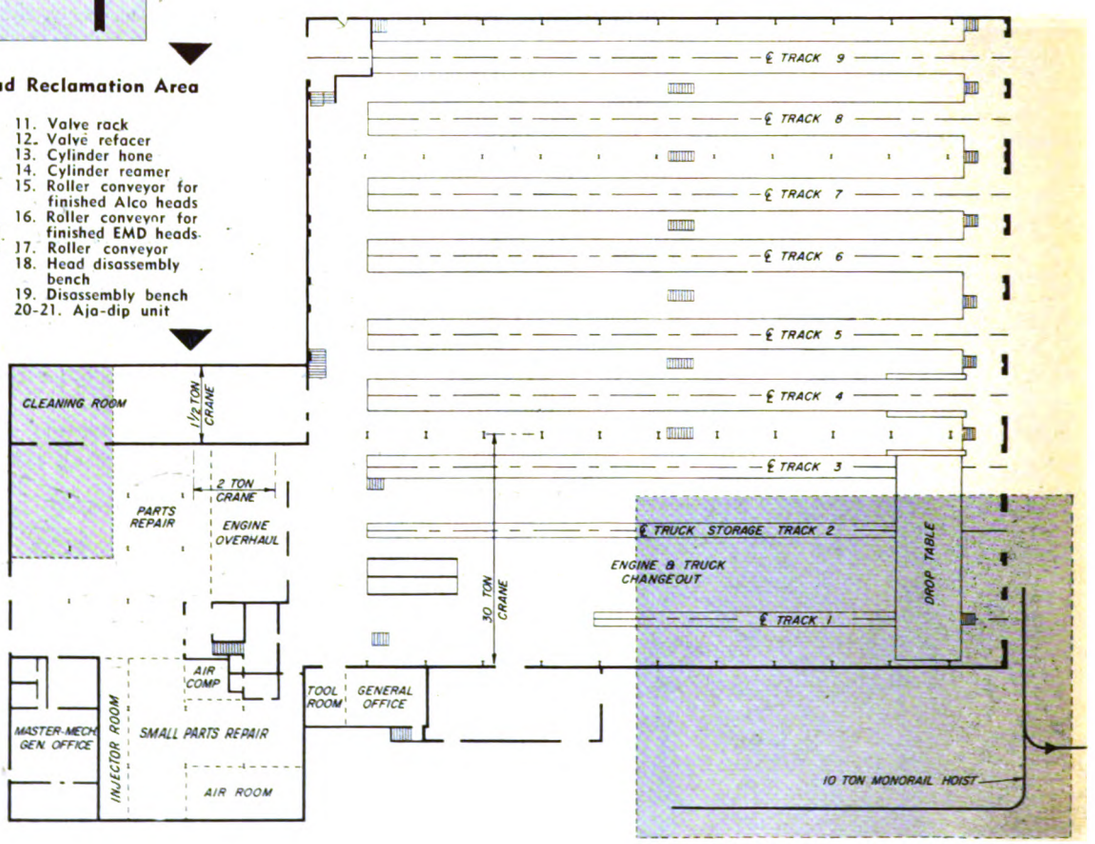
The hoist capacity is 10 tons and the lift 20 ft. In addition to scrap, it handles radiators, trucks, engine bases and blocks and other heavy parts cleaned in the lye vat rather than indoors.

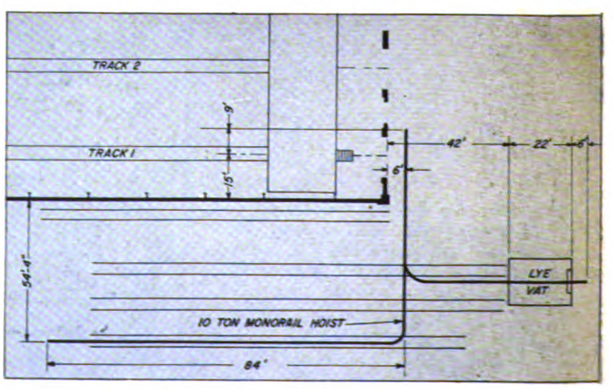
The head reclamation area is adjacent to the cleaning room and connected with it by a roller conveyor which runs through a slot in the wall separating the two areas. Two other roller conveyors—one for Alco and one for EMD heads—are also used in the assembly-line overhaul.



Equipment in Head Reclamation Area

1. Hydraulic Press
2. Jib crane
3. Parts bin
4. Valve seating and assembly for EMD heads
5. Parts bin
6-7. Valve seating and assembly for Alco heads
8. Water cooler
9. Cabinet
10. Washroom
11. Valve rack
12. Valve refacer
13. Cylinder hone
14. Cylinder reamer
15. Roller conveyor for finished Alco heads
16. Roller conveyor for finished EMD heads
17. Roller conveyor
18. Head disassembly bench
19. Disassembly bench
20-21. Aja-dip unit





Type and Amount of Work Done

The diesel shop today handles all heavy work on 348 diesel units and running repairs and inspection on 177 of these while 29 BLW, 16 F-M, 4 Alco and 17 GM switchers are maintained complete up to unit exchange at the point where they are stationed.

The shop turns out an average of seven heavy repairs a month. Work is done complete on engines, small motors and generators. Work on traction motors and main generators is done on a specific time or mileage basis until unit exchange is necessary. Wreck damage and heavy body work is taken care of in an adjoining building, as well as some auxiliary work not handled by unit exchange.

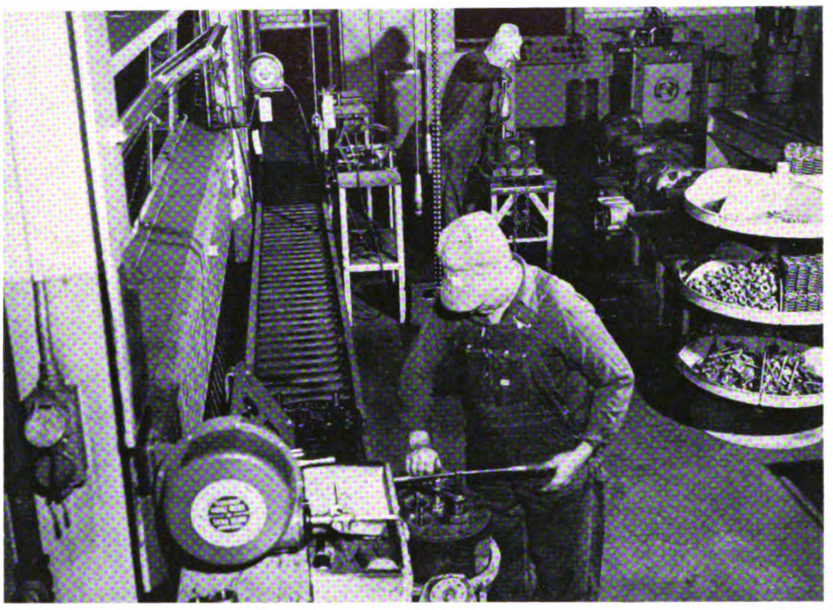
Normally four units at a time are undergoing heavy repairs, two each on Tracks 3 and 9, where operations on the overall locomotive are centered (Track 1 is used for switchers, Track 2 for trucks and 4-8 for trip servicing).

Repair operations begin on Track 3 where the unit is stripped and the body cleaned. Engines are removed here by the 30-ton traveling crane and set on dollies near the engine overhaul section. After stripping, the engine base and block are carried to the lye vat by the traveling crane and the outdoor monorail. At the same time the smaller components make a circular path in being cleaned, overhauled and returned to the repair area for reassembly—not necessarily to the same engine frame from which they were removed.

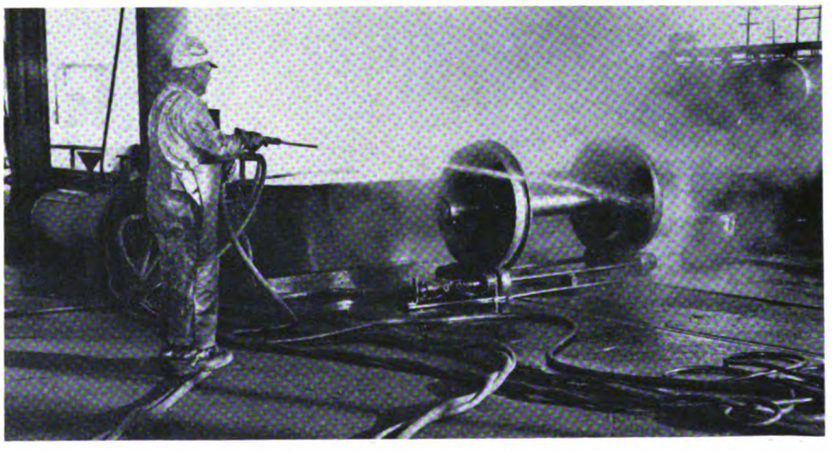
Major components are re-installed on the unit on Track 3, after which it is moved to Track 9 for piping and wiring and for load testing. Any interior painting needed is taken care of on Track 3, exterior touch-up work on Track 9. Complete paint jobs are done in the nearby coach shop.

Because the Frisco believes that it is more economical to tailor a new structure to diesel repair needs than to convert existing buildings, little use was made of the existing steam facilities to handle the growing repair load at Springfield. One large building, the 173 ft by 566 ft former steam erecting shop, was once used for operations requiring large machinery or heavy cranes but now only heavy body work is done outside the main diesel shop.

Heads are cleaned and disassembled in the northwest corner of the cleaning room, loaded into a protective covering and placed on a roller conveyor which . . .

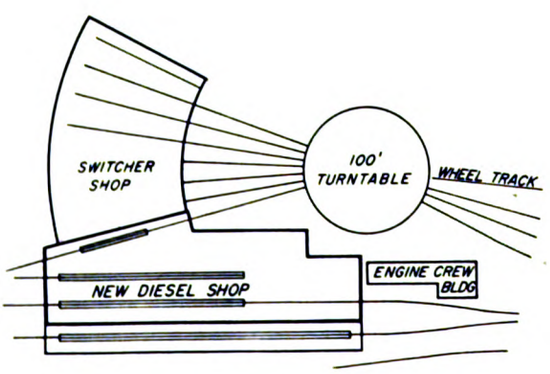


Extends directly into the head reclamation area through a slot in the wall and terminates at a work bench fitted with air hoses, power tools and holding devices to position the head



Wheels are rotated by an air motor while being cleaned adjacent to the lye vat which is served by a branch of the outdoor monorail crane

Outlying Shops



EXTENSION TO ROUNDHOUSE at St. Louis serves as the main diesel shop with stalls in the old house used to maintain switch and general purpose units

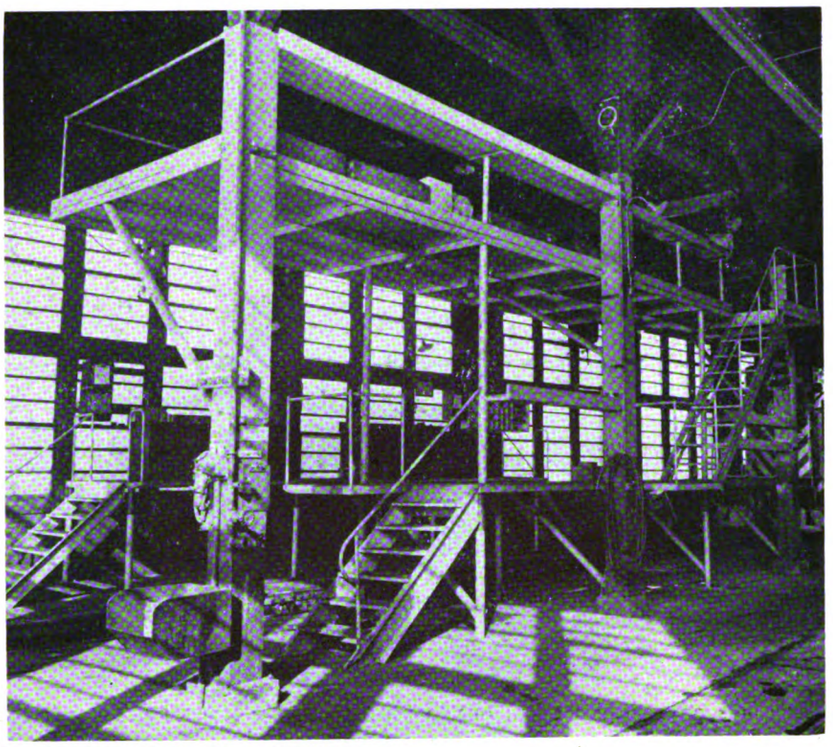
PARTS OF OLD SECTIONS of some enginehouses were retained for storage and for handling jobs like burning or paint scraping that would interfere with work in the main maintenance section

Nearly half of all diesels on the Frisco receive mileage maintenance at the main mechanical facilities at Springfield and most of the remainder at four points—Tulsa, Ft. Smith St. Louis and Amory, Miss. Each of these maintains from 48 to 77 units. Other points under the jurisdiction of master mechanics at the above locations often handle their own switchers. For example, Amory handles 18 Baldwin switchers for engine work up to crank-shaft removal, traction motor and main generator work up to unit exchange and the turning of mounted wheels.

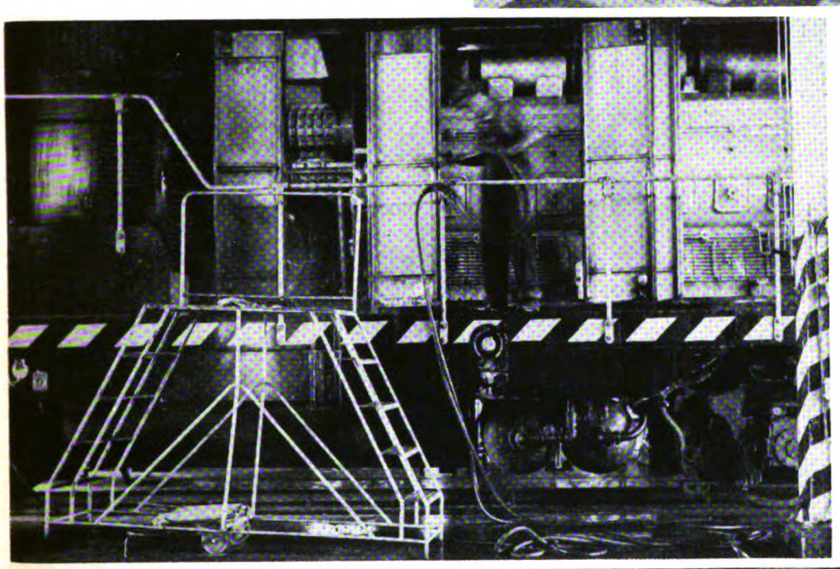
Converted enginehouses are the usual pattern but with a few exceptions such as a combination new straight-line servicing facility with the old house at St. Louis and a new single stall building at Wichita. Side transfer tables for changing trucks are standard at all but the smallest points.

St. Louis is the only maintenace point outside of Springfield that can remove an engine. It has a 25-ton crane with a 5-ton auxiliary hoist. St. Louis works the trucks it removes to restore them to first-class condition

BY CONSOLIDATING THE ENGINE-HOUSE and the callers' offices at several points, the 'phone is manned at all times, the foreman is relieved from running back to answer it every time it rings, and receipt of important messages is not delayed because nobody is within hearing distance of the 'phone.

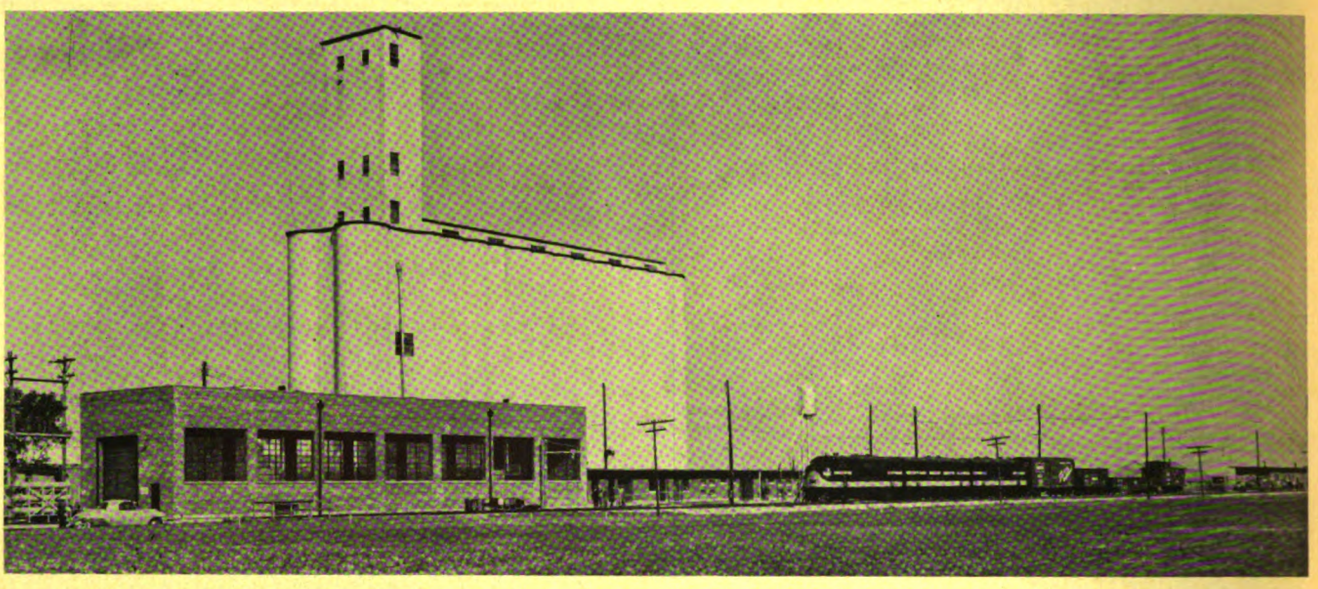


HIGH-LEVEL PLATFORM for working Fairbanks-Morse units at Tulsa. Other major enginehouses have similar special facilities for doing all heavy work up to unit exchange when a large group of a given make is assigned for maintenance



PORTABLE STANDS are widely used at converted enginehouses in place of fixed platforms for servicing both hood and road type units.

COMPACT TRUCK and traction motor repair area at Tulsa includes small traveling crane overhead and wheel lathe adjacent. Side transfer tables like the one above are widely used at outlying points as a compromise between the more expensive drop table and the less efficient practice of rolling trucks out by hand



NEW SERVICING BUILDING 132-ft by 32-ft at Wichita with single through track and 45-ft inspection pit

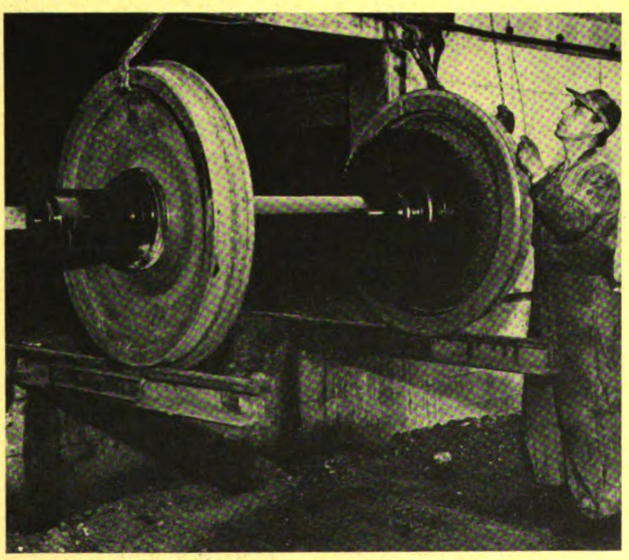
but sends any engines taken out to Springfield for rebuilding. The engine house machine shop does all wheel work, both car and locomotive, for the division except those requiring removal of wheels from axles.

The rather large extension put on the enginehouse opens directly into it. All stalls have a concrete floor but no platforms as they are used for maintaining switchers and general purpose locomotives.

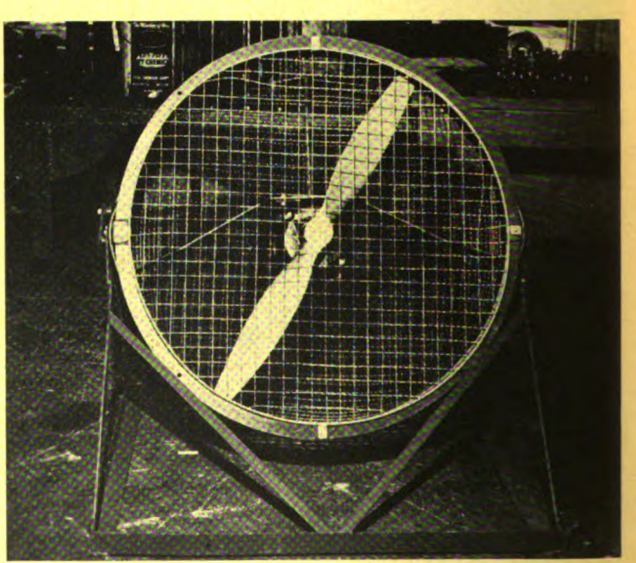
Road units are serviced in the extension itself which has two stalls that can accommodate a four-unit locomotive and one stall that will accommodate a two-unit locomotive. Generally, however, all four-unit locomotives are worked on the outside track because the wheel transfer table is blocked when a four-unit locomotive is worked on the center track.

Tulsa is the largest outlying point and the only shop outside of Springfield to have an exclusively Frisco diesel club. Tulsa maintains 77 units and gives trip servicing to an average of 40 units a day.

Generator and traction motor work to Tulsa-assigned units is done either on a time or mileage basis at Tulsa; and, at a specified time, the above components are sent to the factory on a unit exchange basis. EMD and Alco units are sent to Springfield when engines are due for heavy overhaul, but truck work is done complete on all types of power. Fairbanks-Morse locomotives are given all maintenance up to unit exchange as all Frisco F-M power is assigned to Tulsa and the facilities installed for inspecting and servicing this type of power also facilitate heavier repair requirements.



CANTILEVER RAIL EXTENSION and crane for handling wheel sets and traction motors into the diesel extension of the St. Louis roundhouse. This idea permitted using a convenient storage area on rails across the turntable (which had to be retained to get switcher units in and out of the original stalls)



WHERE PAINTING IS DONE at outlying points not equipped with exhaust facilities the Frisco places this type fan in the pit. While it does not exhaust the fumes to the outdoors it does mix them sufficiently with the shop air to keep the mixture below the flash point concentration

Standard Journal Box in for Change

Proposed modifications in design of parts, new methods of lubrication, additive oils and education of box packers discussed at January meeting of the New York Railroad Club

The united effort which is being made by the railroads, under the leadership of the Association of American Railroads, by many individual railroads, and by various commercial interests to get out of the solid journal bearing in freight service its full capabilities was the theme of the New York Railroad Club meeting held at the Hotel Commodore, New York, on January 20.

The program, sponsored by the AAR, was presented under the chairmanship of W. M. Keller, executive vice-chairman and director of research, Mechanical Division, who introduced the six speakers.

R. G. May, vice-president operations and maintenance department, AAR, opened the program with a brief statement of the things hot boxes do to orderly railway operation. H. W. Wood, assistant chief of motive power, car, Pennsylvania, described the changes that are being proposed in journal-box parts and suggested the procedure by which they can best be made to contribute to an improved standard journal-box assembly. C. S. Patton, Jr., assistant superintendent of motive power, car, Norfolk & Western, told of the tests of that road of waste packing substitutes and stated his views as to the requisites of a satisfactory means of feeding oil to the bearing. M. S. Clark, of the research and technical department of the Texas Company, told of a co-operative program conducted on the N&W to determine whether oils other than that specified by the AAR would reduce hot boxes. R. W. Seniff, manager of research, Baltimore & Ohio, told of the effect of an educational program for the training of employees who service journal boxes in improving journal-box performance. Rosser L. Wilson, vice-president, American Brake Shoe Company, described the Mahwah journal-bearing laboratory* of that company with slides and showed some of the bearing types which have been under study at that point. Some of these are illustrated.

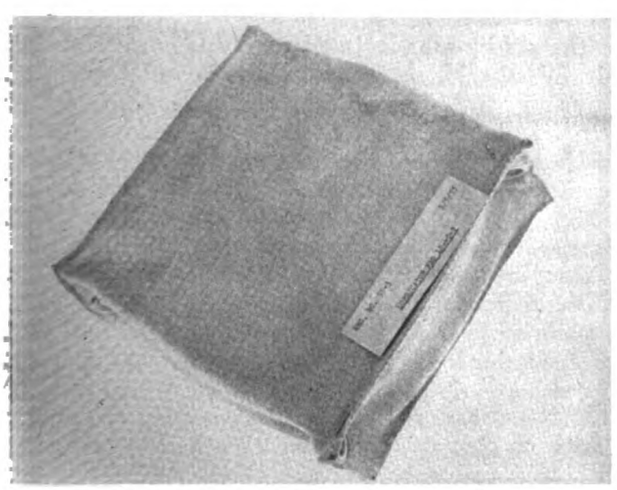
*For a description of the Mahwah laboratory see Railway Locomotives and Cars for May 1954, page 67.

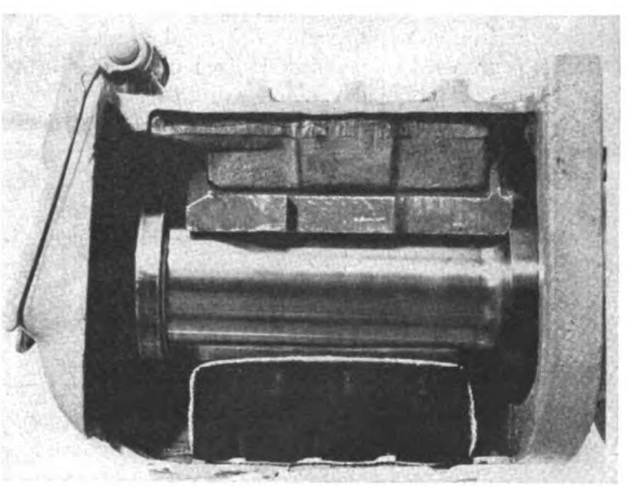
We believe that more can be done to prevent hot boxes by education than by any other way. To us, it means that the education starts at the top and works downward and laterally through all the individuals who are in any way connected with the operation and maintenance of freight cars.—R. W. Seniff, manager of research, Baltimore & Ohio.

Hot Boxes Upset Orderly Railway Operation

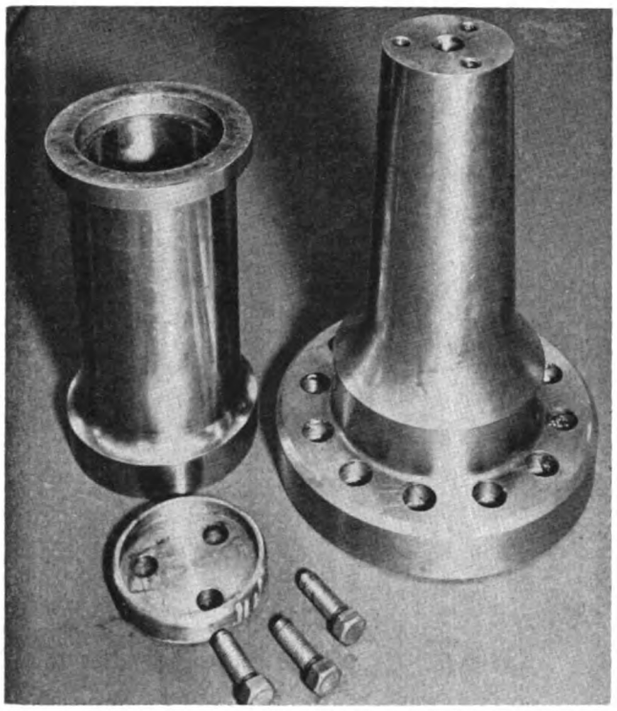
Before he dealt directly with the effect of hot boxes on railroad operation, Mr. May said that the AAR was glad to sponsor the meeting because it served to bring railroad men up to date on journal-box developments, which are moving rapidly. The AAR, said Mr. May, has for some time been extensively engaged in research and the results have been profitable. From 55 of the 90 research projects which have been undertaken by the association, he said, it had been estimated that the railroads had profited to the extent of $100,000,000 a year. In the case of journal-box lubrication, he said that research projects have been conducted for the association at Franklin Institute and the Illinois Technical Institute, by the association, itself, and by individual roads.

Several operating problems are created by the occurrence of a hot box, he said. First, the dispatcher may have his train movements upset and may have to realign the movement of several trains. Then, the yard master, who has his tracks and yard crews arranged for an expected on-time movement, must readjust his plans and





THE REDIPAK LUBRICATOR (left) developed in the test plant of the American Brake Shoe Company at Mahwah, N. J. It is a molded neoprene foam block with cored passages covered with cotton wicking material. It is square and gromets in the corners permit use of a packing hook to remove it from the box. Right—The Redipak shown in section



A RENEWABLE axle sleeve developed at the American Brake Shoe Laboratory at Mahwah. It is hardened and ground. If damaged, it can be removed and replaced by means of a hot-water shrink fit.

suffer a loss of yard-crew time. Road-crew overtime results; it may be necessary to call an extra crew; the outgoing crew, called with the expectation that the train will arrive on time, will collect for the initial terminal delay. Even more serious than these losses and annoyances are the hazards created by hot boxes which occur in fog or snow storms and so escape detection.

In concluding, Mr. May spoke with satisfaction of the progress which is being made in improving journal-box performance. This must go on, he said, until the full potential of the solid bearing has been developed.

New Journal-Box Detail Designs

Today there are on the railways of America three types of packing retainers, at least nine types of journal lubricators, seven types of lubricating pads, several new ideas on journal bearings, and other items, all intended to make a freight car operate with minimum difficulty from hot journals. In designing equipment for use in the journal-box assembly, Mr. Wood said, parts must have longer life and be trouble free for longer periods. Roads must ultimately be able to extend repack periods to at least 36 months to coincide with the period for air-brake attention. Minimizing the need for journal-box servicing at originating, interchange and intermediate points is necessary to reduce opportunities for man failure and to effect substantial economies.

A pressing need is a more trouble-free method of

Progress in improving journal-box performance must go on until the full potential of the solid bearing has been developed.—R. G. May, vice-president, Operations and Maintenance Department, AAR.

While we realize our responsibility to investigate new designs of products to determine their value, we nevertheless feel that faster and more satisfying results acceptable to all railroads could be obtained by a coordinated testing procedure . . . Additional funds should be delegated to the AAR and a comprehensive testing program conducted to consolidate and perfect the designs that have been presented to the association in the past five or six years.—H. W. Wood, assistant chief of motive power, car, Pennsylvania.

applying lubrication to the journal and bearing. Three approaches to this problem are the waste retainer, the lubricating pad, and the journal lubricator. Five years' records on the Pennsylvania show that waste retainers have produced favorable results. Too much trouble has been experienced with the wire spring type being broken or out of place, however. Some require removal several times between repack periods to set up the packing. For ultimate success, he said, these objections must be overcome. Lubricating pads are in the process of improvement as the result of tests in service. Journal lubricators are on trial on many roads. Some of them have required modification to withstand the service shocks to which they are subjected on freight cars.

A number of designs of journal bearings, such as the ductile iron bearing, the flat-back bearing, the counterbored bearing, the ventilated bearing, and the full sleeve type bearing, have been offered to the railroads and tested to some extent. Probably a combination of the best features of these types will produce better results than those obtained from existing bearings. Mr. Wood believes that consolidation of the bearing and wedge would be an improvement and suggests that effort be made to perfect and test such an arrangement.

Mr. Wood told of the tests made by the Pennsylvania on the ventilated bearing designed by the AAR. The tests included some of the other devices previously mentioned. Conclusions from these and other tests are that the ventilated bearings ran from 10 to 20 deg cooler in hot weather, he said. Lubricating pads produced lower temperatures than waste packing, but have had to be changed to overcome weaknesses. Thread risers in waste-packed boxes are still a problem and retainers are beneficial in reducing this condition.

The refrigerator-car tests of fitted journal bearings, Mr. Wood said, show definitely improved bearing performance and decreased overheatings. This requires step size journals, and a system of marking journals and bearings has been developed to minimize main failure in the application of the bearings. The journal sleeve design, if perfected, will require but one size of fitted bearing which can be applied to the standard axle without a sleeve or to the axle with the sleeve. Mr. Wood recommends the elimination of the axle collar, application of a sleeve similar to that employed by the roller-bearing manufacturers, and one size of bearing for each axle size. He considers that much is to be gained if the best features of the fitted bearing of flat-back design, the journal sleeve and the collarless journal are combined and a new design of journal-box assembly developed.

The Pennsylvania is planning to test bearings made

It is very doubtful whether any railroad can afford to continue spending the money necessary for maintaining waste-packed journal boxes well enough to meet today's demands of long trains operated at high speeds and with short terminal time. It will be largely up to the management of every railroad to decide whether a little more should be spent now in development in order to reduce high maintenance costs later, particularly when some of those costs are hidden.—C. S. Patton, Jr., assistant superintendent of motive power, car, Norfolk & Western.

of aluminum alloy and tests will also be conducted with journal sleeves to provide for the use of fitted bearings, which should not only reduce hot boxes, but also lengthen the life of freight-car axles.

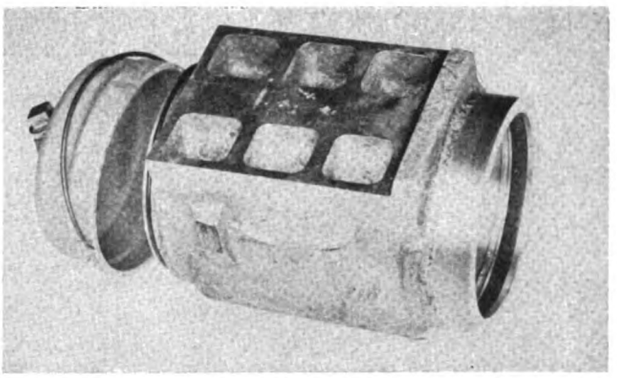
"While we realize our responsibility to investigate new designs of products to determine their value," he said, "we nevertheless feel that faster and more satisfying results acceptable to all railroads could be obtained by a coordinated testing procedure . . . Additional funds should be delegated to the AAR and a comprehensive testing program conducted to consolidate and perfect the designs that have been presented to the association in the past five or six years."

New Lubricating Devices Promising

The waste-packed journal box, said Mr. Patton, has survived almost unchanged from the earliest days, while nearly every other feature of railroad equipment has been vastly improved. This is because the first cost of waste is lower than any present substitute; it can be reclaimed and reused indefinitely; it requires no highly skilled labor to install and maintain it, and, given adequate attention, its performance is good. But maintenance costs are high and are accompanied by train delays at each terminal for inspection, setting up the packing, and additional lubrication. Waste tends to cling to the journal, to roll in the box and to creep under the bearing. About 40 per cent of hot boxes on the N&W are charged directly to waste grabs and half as many to lint accumulations, not including a large proportion which are listed as "undetermined." There is now a general feeling that little further improvement can be expected in the performance of the waste-packed box.

A satisfactory substitute, said Mr. Patton, must provide adequate lubrication under adverse conditions. Its overall cost must come within the range of the waste-packed box; it should eliminate waste grabs and lint accumulations; it should work in the present box with minimum modifications; it should not need skilled mechanics for servicing, and it should not be subject to sudden failure.

Mr. Patton told of the five pad-type lubricators which the N&W now has under limited test: (a) cotton yarn loops sewed through a canvas backing and then rolled into a pad; (b) two different cellulose sponge lubricators; (c) a pad of nylon fibers platistically bonded together at elevated temperatures; (d) waste cemented and stitched together around a neoprene core resembling a honeycomb; (e) a neoprene rubber sponge center enclosed in a canvas bag through which are sewed a bed of cotton yarn loops. None has had sufficient service to determine whether it is going to be the answer to hot boxes. All exhibit improvements over waste packs in reducing lint and avoiding waste grabs, he said, and require only reasonable oil consumption. First cost is higher than waste, but only careful records over several years will determine the overall cost. They run at least twice the present repack period before requiring removal, he said. Most of them do a little better lubricating job than waste and he thinks that bearing life may be extended. Operating temperatures are definitely better than with waste.



A CARTRIDGE sleeve bearing unit to fit in a standard journal box. The body is a one-piece babbitt-lined bronze casting, with a cored oil reservoir and pad lubricator. It is held in place by a bolted-on journal collar and closed by a snap cover. Developed at the Mahwah laboratory of the American Brake Shoe Company

"It is very doubtful," said Mr. Patton, "whether any railroad can afford to continue spending the money necessary for maintaining waste-packed journal boxes well enough to meet today's demands of long trains operated at high speeds and with short terminal time. It will be largely up to the management of every railroad to decide whether a little more should be spent now in development in order to reduce high maintenance costs later, particularly when some of those costs are hidden."

Better Oils Improve Performance

For about 20 years from 1929, Mr. Clark said, no great changes were made in the quality of car oils. This was because of the fairly rigid AAR specifications covering straight mineral oils to meet which it was not necessary to provide highly refined or additive type car oils. The low revenue derived from these low-cost oils did not encourage much research on the part of the suppliers.

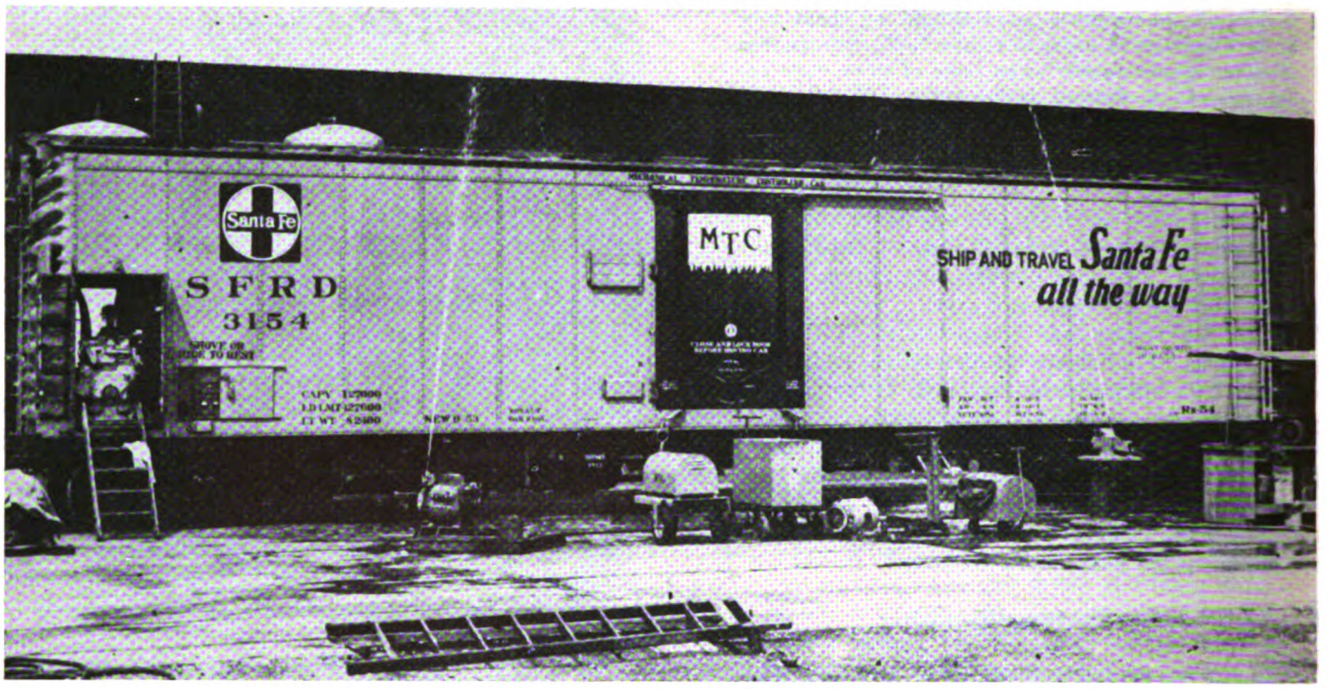
For some the need has been felt for higher quality

(Continued on page 155)

We do not feel that any journal-box oil will be a panacea for all the hot-box troubles on a railroad. A good oil is only one of the factors.

Although we feel that a premium car oil represents a substantial improvement . . . we do feel that a still better product could be made if economic factors were not too stringent.

Regardless of what medium is used to get oil to a bearing, it is our conviction that oil quality in the long run will pay for itself.—M. S. Clark, Research and Technical Department, Texas Company.



A REFRIGERATOR CAR being cooled down to operating temperature after inspection. The water sprays speed the process materially

Santa Fe Girds to Service Reefers

In anticipation of things to come, the San Bernardino shop is being equipped to inspect and maintain mechanical refrigeration cars

■ The Santa Fe has developed means for maintaining mechanically refrigerated cars at its San Bernardino, Cal. shop, and is increasing and improving its facilities to take care of the rapidly growing number of such cars, which are being placed in service.

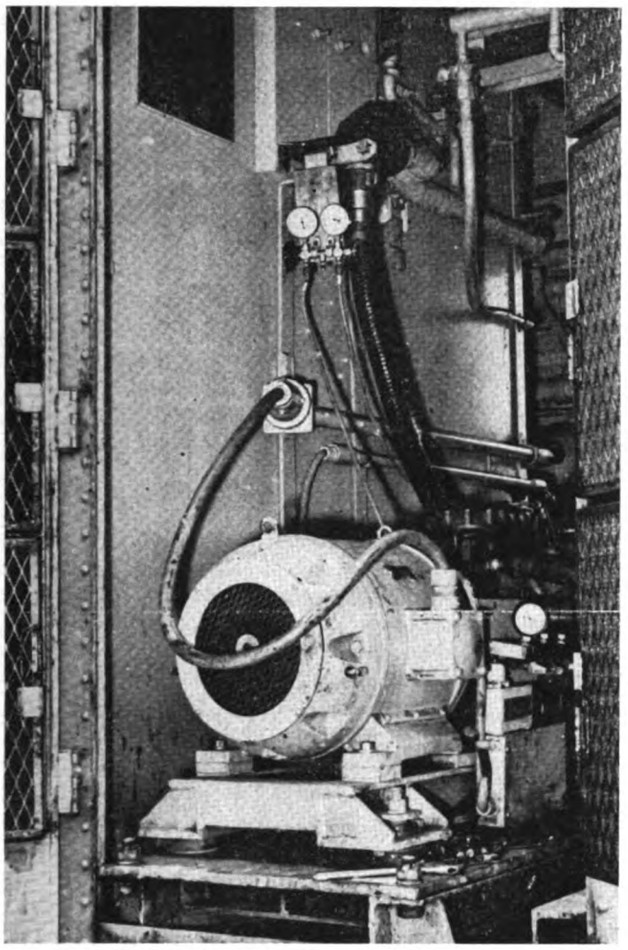
Mechanical refrigerator cars require pre-trip, monthly, two-month, semi-annual and annual inspection. San Bernardino makes part of the short term inspections and all annual inspections. It also performs all heavy overhaul, including all engines and compressors.

Thirty-six items appear on the pre-trip inspection requirement sheet. These include the checking of all oil, water and refrigerant levels and pressures, making sure there are no leaks, cleaning of screens, strainers, sumps and pans, checking the operation of protective and operating devices, measuring battery electrolyte gravity and charging current, checking motors for correct rotation, adding lubricant where necessary and filling fuel tanks. Finally, with all equipment functioning properly, the car is cooled down to —5 or —12 deg F.

Since the climate at San Bernardino permits, the work is done in the yard and during the cooling down run the exterior of the car is sprayed with water. Evaporation is high and cooling time is materially reduced in this manner. On one test run, the interior temperature of a car was reduced from +27 deg F. to —1 deg F in 3 hours. Without the spray, it is difficult to bring the temperature down in the time available.

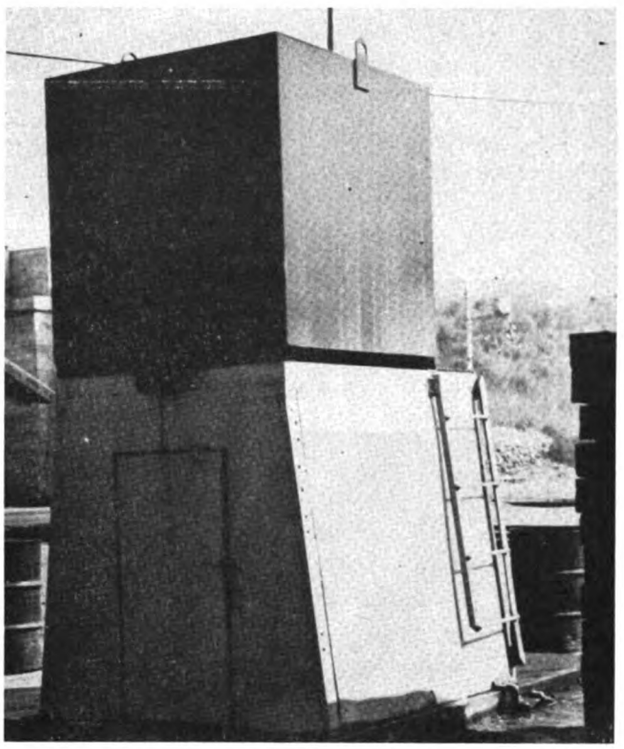
During the monthly inspection all of the pre-trip inspection is repeated and, in addition, filters are changed, linkages lubricated, the refrigeration system checked for leaks, radiators blown out, fuses and pilot lights checked, electrical connection terminals tightened, motors and generators inspected and serviced, and all mounting and fastening of bolts and clamps is made secure.

Additional work done at the time of the two-month inspection includes changing of lubricating oil in the engine and fuel injection pump, blowing out the engine radiator, cleaning the air cleaner tray, greasing generator,

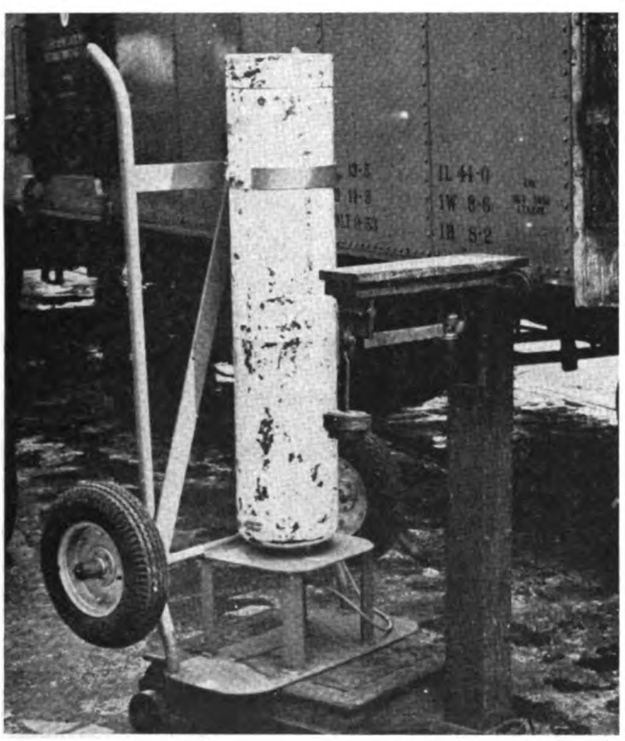


INTERIOR of one of the engine-generator compartments

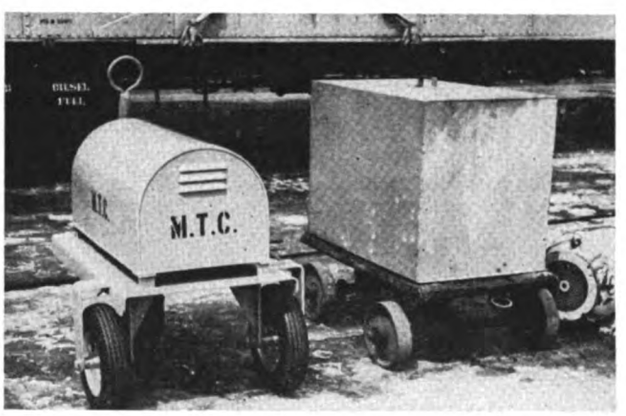
PORTABLE inspection yard fuel tank



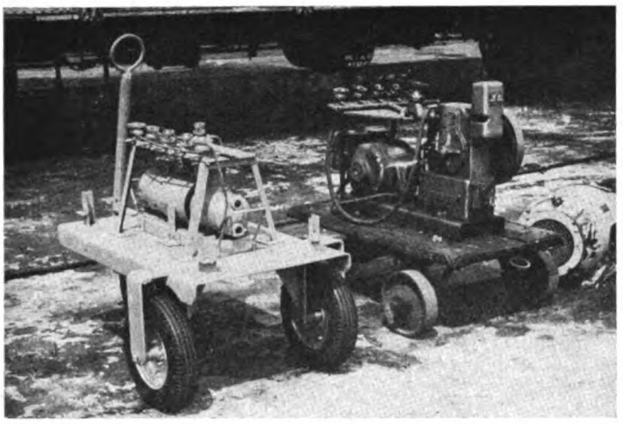
FUEL is normally supplied from this tank in the departure yard



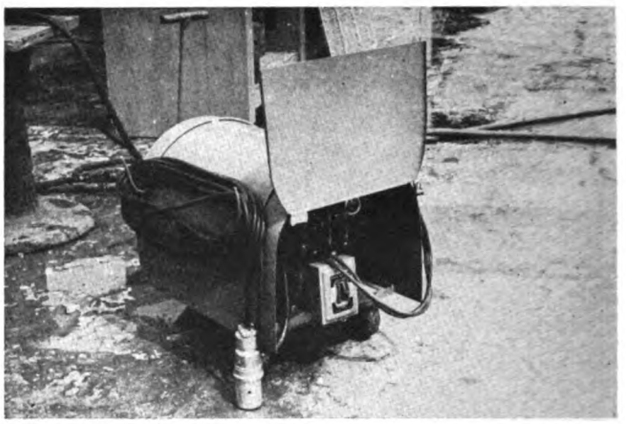
FREON TANK in tipping mount on the weighing scale



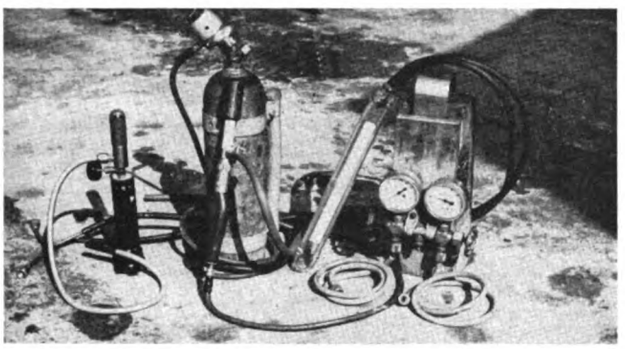
MOTOR-DRIVEN vacuum pumps with protective housings



PORTABLE motor-driven vacuum pumps with covers removed

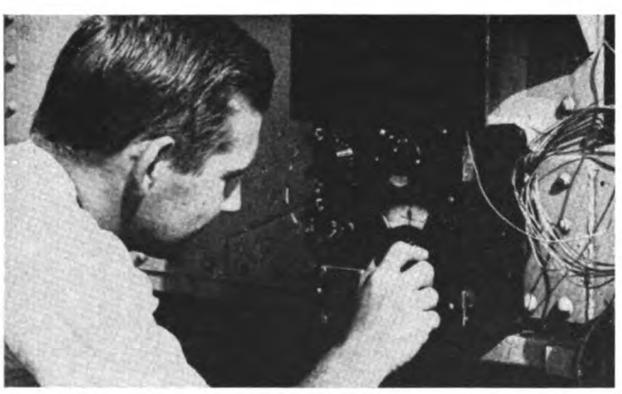


PORTABLE motor-generator set for charging 12-volt batteries



FROM left to right, alcohol-burning leak detector, Prestolite leak detector, manometer and manifold gage

A PORTABLE voltmeter is used to check load and no-load generator voltage



A 16-POINT temperature measuring device quickly determines temperature at various points in the car

radiator fan, evaporator fan and compressor motor bearings, and checking the setting of safety switches.

At the time of the semi-annual inspection, injectors and injector nozzles are inspected and fuel pump and injector timing is checked in addition to the work done on shorter time inspections.

For the annual inspection, the additional work done includes repair of racks, floors, linings, lading anchors, door seals, complete overhaul of running gear and brake rigging, and the sandblasting and painting of trucks and car if necessary.

The time between engine overhauls is expected to be about two years.

Certain special equipment is necessary for the servicing of the cars. At present the Santa Fe is using two motor-driven pumps for removing moisture and air from the refrigerating systems. These pumps must be capable of pulling a high vacuum since moisture cannot be removed unless the vacuum is more than 29.6 in.

It is necessary to remove, restore and add refrigerant to the cooling systems and for this purpose a tipping truck, shown in one of the illustrations, is used for handling freon cylinders.

A fueling tank on a truck is used for fueling cars in the overhaul yard. A larger stationary tank in the departure yard is used regularly for filling fuel tanks. An air motor-driven pump is used for filling this elevated tank.

Some foreign cars serviced in the yard are equipped with 12-volt batteries. To insure that these cars leave with fully charged batteries, there is a portable motor-generator set which receives its power from the yard standby power lines.

Instruments include a portable voltmeter for checking generator voltage at load and no load. There is a manometer for measuring the difference of pressure between the intake and outlet of the evaporator. This is used for setting the defrost switch.

There are two halide leak detectors. One, which is of small size to allow for easy portability, employs an alcohol torch. The other, somewhat larger, uses a gas flame supplied by a tank of compressed gas.

Manifold gages are used for measuring pressures on the high and low side of the compressor and a Minneapolis-Honeywell temperature measuring device with a 16-point switch is used for measuring temperatures throughout the car and for setting superheat on the expansion valves.

MEMBERS of the Land Transportation Committee attending the Winter General Meeting of the American Institute of Electrical Engineers held in New York, January 31—February 4. Top row, left to right: H. P. Wright, Electrical Engineer, Baltimore & Ohio, S. R. Negley, Electrical Engineer, Reading, P. H. Hatch, General Mechanical Superintendent, Long Island, E. A. Foster, Fairbanks, Morse & Company, A. M. Harrison, Westinghouse Electric Corporation, J. H. Ray, Electrical Engineer, Erie, Llewellyn Evans, Tennessee Valley Authority, J. C. Aydelott, General Electric Company, D. F. Haney, Assistant Engineer, Diesel Equipment, Canadian Pacific; W. S. H. Hamilton, Consulting Engineer; lower row, left to right: Charles W. Martin, Diesel Electrical Supervisor, Baltimore & Ohio, V. F. Dowden, Assistant Mechanical Engineer, New York, New Haven & Hartford, P. G. Lessmann, Westinghouse Electric Corporation, H. F. Brown, Gibbs & Hill, Inc., R. L. Kimball, Gibbs & Hill, Inc., Maurice C. Swanson, American Locomotive Company, J. Stair, Jr., Electrical Engineer, Pennsylvania, L. E. Birch, Ohio Brass Company, and L. S. Billau, retired, Baltimore & Ohio

Electrical Engineers Talk Traction

■ Rectifier-type electric locomotives and cars and their influence on communication circuits were major railroad subjects under discussion at the Winter General Meeting of the American Institute of Electrical Engineers, held in New York, January 31-February 4, 1955. Thermal stability of a new type of traction motor insulation and an electric snow plow for operation with diesel-electric locomotives were also the subjects of papers and discussion.

Rectifier-type locomotives and multiple-unit cars, traction motor insulation and an electric snow plow receive attention of AIEE

Ignitron M-U Cars

There are now 100 Ignitron rectifier-type, multiple-unit cars in operation on the New Haven. A paper giving detailed information concerning their construction and design by E. W. Ames, Westinghouse Electric Corporation, and V. F. Dowden, assistant mechanical engineer New Haven, was presented by Mr. Dowden. These cars were described in the March 1954 and June 1954 issues of *Railway Locomotives and Cars*.

Some pertinent information concerning the performance of these cars was developed during discussion. From this it was made evident that riding characteristics of the cars are exceptional—that motor cars are as smooth as trailers. Commutators of the diesel-type d-c traction motors are in perfect condition after 75,000 miles of operation; a performance record that is much better than that for a-c motors in the same service. Brush life is much longer than that on a-c motors and there are fewer brushes. One of the advantages of using d-c motors is that they are now in quantity production. It is the belief of railroad electrical engineers that rectifier locomotives and cars will cause railroads to use more straight electrification. Commercial type rectifier tubes are now used. There have been no arc-backs except for two caused by defective tubes. The 400 tubes on the New Haven cars have been in service 10 months, and those in service on the Pennsylvania indicate they are a long-life device.

D-C Motors on Rectified Power

Special considerations which need be given to the operation of d-c locomotive traction motors on rectified a-c were covered in a paper by M. Simon, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. Mr. Simon explained that in past years various attempts have been made to power locomotives by 25-cycle, single-phase rectified voltage applied to d-c series motors. Early efforts were unsuccessful, mainly because of the faulty operation of the mercury-arc rectifier. Continued research and development, however, have now made the operation of d-c traction motors on mercury arc rectifiers in locomotive service entirely feasible from

a technical standpoint. In recent years an additional feature has entered the picture. The development of the diesel-electric locomotive has resulted in a standardized, low-cost, d-c traction motor suitable for general purpose road locomotive applications. Hence, any present-day electric locomotive design employing d-c traction motors can benefit by the use of such standardized motors. An example of this is found in the rectifier locomotives recently built by the General Electric Company for the New York, New Haven and Hartford wherein the standard d-c traction motor was applied. The problem of operating these motors on rectified single-phase, 25-cycle power resolved itself into the problem of smoothing the undulating current to a sufficient degree so that this motor would not be harmfully affected from either a stress or performance standpoint.

Although rectified alternating current has been used for many years as a source of power for d-c motors, it has largely been derived from multi-phase rectifiers operating on three-phase systems. The current resulting from such a system is essentially pure direct current, with an insignificant amount of ripple. On the other hand, the ripple existing in the output of a rectifier operating on single-phase alternating current is of considerable magnitude and would adversely affect both motor performance and maintenance. Fortunately, this ripple can be reduced by filter components of practical size to a point where its adverse effects are limited to a tolerable value.

Mr. Simon's paper explains the effects of eddy current. commutation, heating, torque pulsations and smoothing reactors and their relation to design characteristics.

Concerning motor modifications, Mr. Simon says: "As installed on the New Haven rectifier locomotive, the standard d-c traction motor as applied with the rectifier locomotive was slightly modified for 660-volt third rail operation into Grand Central Terminal, New York City. One of these modifications was provision for a ground return current path to bypass the 660-volt current around the locomotive roller bearing journal boxes. The standard axle lining flange dust guard was replaced with a combination dust guard and ground brush assembly. The ground return cable is connected to the ground brush assembly.

"Another modification consists of a flash ring assembly designed to provide motor armature bearing protection by directing flashover currents to ground through the ring.

"These modifications are designed as features which can be easily added to the standard diesel-electric traction motor."

Mr. Simon's conclusions are as follows: "Because of the relatively small quantity of rectifier locomotives involved, the most economical application of a d-c traction motor on rectified single-phase, 25-cycle power is one that employs a standard production-type motor with sufficient series reactor to properly limit the ripple. Motors possessing inherent load characteristics that permit the use of a reactor that saturates with load have definite advantages for such applications. A further development that would benefit this type of power transformation includes d-c motor operation on rectified 60-cycle power."

"Thermal Stability of a New Insulating Material Used in Traction Motors" is the title of a paper presented by R. W. Finholt, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. Mr. Finholt outlines the requirements of traction motor insulation as follows:

"Modern traction motors operate under severe conditions. The latest adopted standard for traction motors lists them as Class B according to the 1943 AIEE Standard No. 11 and the ASA C35.1-1943. This provides that the peak value by resistance of the armature shall not exceed 160 deg C, and the peak value for the fields shall not exceed 170 deg C. Modern traction motors on heavy diesel-electric locomotives often exceed these temperature limits by 20 to 30 deg C. The temperatures in the hottest part of the armature and the hottest part of the field will exceed these average resistance measurements. Coupled with these high temperatures are severe vibration conditions, dust, water, varying humidity, highly variable maintenance and shock. Most traction motor equipment operates on 3,000 volts or less on direct current, or 1,500 volts or less on alternating current. The railroads expect and get long motor life coupled with a very high degree of dependability.

"A general problem in insulation is that of high temperature combined with a number of mechanical destructive factors. In the search for better materials, tests have been run on the high-temperature materials that have become available in the last 15 years. One of these, in particular, has proved to have such excellent properties, both physically and economically, that the General Electric Company is adopting it widely for use on traction motors. This new material is known as mica mat."

The form of mica mat found most useful in traction motor insulation is impregnated with silicone resin. It is used both as wrappers on armature coils and as tape on field coils. The first heat tests made on mica mat were made on flat sheet heat-aged at 250 deg C for five days. Mica mat sheets impregnated with alkyd resin, with silicone, and with several polyesters were tested. At the end of a week only the sheet that had been impregnated with silicone retained its original properties. The other sheets had become brittle, mechanically weak, and had all but lost their original dielectric strength.

Extensive straight thermal testing showed that mica mat had properties far in excess of those actually needed for the operation.

Tests made combining heat and pressure showed that silicone-treated flat sheet material which is used as a wrapper on armature coils has a crush resistance of about 10,000 psi at 200 deg C. The glass-backed tape has a crush resistance of about 8,000 psi at 200 deg C. These values are both lower than the 18,000 psi of the mica tape which they replace, but they are satisfactory for most normal use.

Life tests involving high temperature and extreme vibration demonstrated that mica mat was a better insulation than copper was a conductor at high temperatures, and that the limiting feature in a motor might not be the insulation, but the copper.

Field tests, now running into the fourth year have made it evident that mica mat is not simply an adequate substitute for mica tape on armature coils, but rather a superior insulating material. It is at once lower in cost, gives more uniformly shaped coils, will stand more heat and vibration and is somewhat easier to use in the factory.

Mr. Finholt also adds a note of caution. He says: "On the other hand, field tests showed that mica mat was not a universal substitute for mica tape. At the present time,

it does not seem suitable for taping armature conductors, although it makes excellent wrappers for ground insulation on armature coils. Neither does it seem suitable for field coils where high pressures are exerted in manufacture or in use. As shown before, there are definite limitations to the pressures this material can stand. There are still other places where it has been found unsuitable because of mechanical deficiencies as compared to mica tape. Where properly engineered, it has turned out to be a most satisfactory insulating material for traction motors."

Power for Cars

A new d-c power supply for railway cars was described in a paper presented by E. F. Bredenburg, Locomotive and Car Equipment, General Electric Company, Erie, Pa. It consists of a d-c generator and a three-phase a-c standby motor similar to the equipment supplied previously by the General Electric Company and differs primarily because of the control equipment used. The use of a separate exciter eliminates the need for a pole changer and the multiple-finger voltage regulator is replaced by two relays. The system is described more in detail elsewhere in this issue.

New Haven Rectifier Locomotives

Rectifier-type electric locomotives which receive 11,000-volt, a-c power from the contact system and employ d-c motors which operate on rectified a-c power were described in a paper presented by F. D. Gowans, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. Delivery of 10 such locomotives to the railroad was begun in December 1954. They are described in an article which appeared in the February 1955 issue of *Railway Locomotives and Cars.*

During the discussion of the paper, a questioner wanted to know why the motors were arranged with two permanently in series, since the probability of wheel slip is less when all motors are in parallel. Mr. Gowans replied that transformers like voltage, and motors like current, a circumstance that leads to lower cost design when two motors are permanently in series.

The possibility of using germanium or silicon rectifiers was raised and the thought was expressed that such developments would definitely improve the prospects for more straight electrification.

Effect of M-U Cars on Communication Lines

Inductive coordination considerations necessary to prevent rectifier type m-u cars on the New Haven from causing objectionable interference to communication circuits were dealt with in a paper by L. J. Hibbard, Westinghouse Electric Corporation, East Pittsburgh, Pa., F. T. Garry, Southern New England Telephone Company, New Haven, Conn., and G. N. Loomis, New York, New Haven & Hartford. The paper was presented by Mr. Loomis.

Paralleling telephone and railroad communication circuits are for the most part carried in cables, but there are also some open wire lines. For test purposes, telephone circuits were used with the far end terminated in a balanced impedence to ground. Open wire circuits were connected to cable pairs that had been terminated in a balanced impedence to ground. Railway communication lines are supplied with drainage circuits.

Test results indicate the following facts: A large number of rectifier motive power units do not have a directly additive effect on each other. Multiple-unit rectifier motive power without a-c filters produces approximately the same noise levels as existing motive power under similar load conditions. Multiple-unit rectifier motive power with a-c filters produces lower noise levels than existing motive power under similar load conditions.

Bogies for Rectifier Locomotives

Design features which must be included in a rectifier-type locomotive if it is to meet railroad requirements are outlined in a paper presented by H. S. Ogden, Locomotive and Car Equipment Department, General Electric Company, Erie, Pa.

The first of these requirements is that the locomotive be able to duplicate or exceed the performance of present locomotives equipped with 25-cycle commutator motors. Extensive stand tests showed that the motors can deliver these high horsepowers for short periods. The tests also indicated that motor commutation is sufficiently good to permit these high outputs to be attained with the expectation of reasonable commutator and traction motor maintenance.

In the process of working out a suitable design, it was necessary also to include such considerations as wave shape, rectifier connections, trolley voltage requirements, rectifier arc backs and telephone interference. Mr. Ogden concludes that the design features which should be incorporated in a rectifier locomotive to insure maximum performance with minimum weight and cost may be summarized as follows:

1. The traction motor should be a standard low-cost unit developed for diesel-electric locomotives.

2. Direct-current smoothing for the benefit of the traction motor is best achieved by an iron core smoothing reactor built large enough to take care of all requirements.

3. Rectifier tube circuit connections should be of the bridge type rather than the diametric type.

4. Firing circuits should be arranged for satisfactory operation over the maximum trolley voltage variations that will be encountered in service.

5. Main transformers should be built with optimum reactance for minimum weight and size. The additional current limiting reactance should be built into divided current limiting reactors, division being in accordance with the basic circuits of the rectifier connections.

6. Telephone interference problems are minor in nature and can be corrected by the addition of a relatively small RC type filter circuit across the rectifier input.

Graphic Aids to Locomotive Design

"Graphic Aids for Calculating Locomotive Performance" were developed by R. D. Charlton, General Electric Company, Erie, Pa., and presented in a paper by that name. The purpose of such a grahic study is explained by Mr. Charlton as follows:

The success of any product is often determined by its ability to give customer satisfaction when operated under a wide range of conditions. All too often, these conditions

differ appreciably from the specification upon which performance guarantees are based. To assure product satisfaction, the ability correctly to project knowledge of product behavior from known to unknown regions is essential.

Electric locomotives are usually sold to a specification, and performance is calculated over a given profile on the assumption that voltage at the trolley is the specification value. The accuracy of this assumption depends upon the system itself and the nature, magnitude and relative location of other system loads.

To be confident that a locomotive, as specified, will give satisfaction when applied, it is necessary to put the locomotive and the system together, early in the design stages.

In the process of designing some 11,000-volt, 25-cycle rectifier locomotives, it becomes desirable to investigate the locomotive performance, recognizing the effect of system constants and normal operating procedures upon locomotive performance.

Because graphic methods offer a way of organizing knowledge, to permit systematic extrapolation into unknown areas, a generalized graphical method was developed for calculating speed-tractive force curves. This method was calibrated by comparison with test values obtained for the same conditions.

In addition to determining performance, this method has assisted in visualizing the relative effect on performance of the several factors involved.

Effectiveness of the methods used were later verified by comparing the charted characteristics with those of the finished product. Accuracy of the method is indicated by the ratio of calculated speed to test speed. The difference between the two, ranges from one to three per cent.

An Electric Drive for Rotary Snow Plows

An electric drive for rotary snow plows is described in a paper by A. H. Hoffer and R. E. Willhite, both of the Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. Power for the operation of the plow is obtained from a diesel-electric locomotive unit. The design of the rotor drive is extraordinary in that it makes 85 per cent of the power of the driving unit available to the plow over a wide variation of snow conditions. More about this in a subsequent issue of *Railway Locomotives and Cars.*

Power Supply for Railway Cars

By E. F. Bredenberg

Locomotive and Car Equipment Department
General Electric Company, Erie, Pa

General Electric's improved axle-generator system has vibrating voltage regulator and exciter which eliminates the pole changer

■ The new rotating equipment consists of a 4-pole d-c shunt generator, a 6-pole exciter, and a 4-pole, 3-phase, 60-cycle, 220-volt induction motor assembled on a common shaft. The generator armature, fan, and a-c rotor are on a common sleeve to provide for a minimum pressing tonnage. This machine is driven either from a car axle through a drive unit and clutch or from wayside power through its induction motor. The generators are built for three voltage ratings, namely 40, 80 and 140 volts.

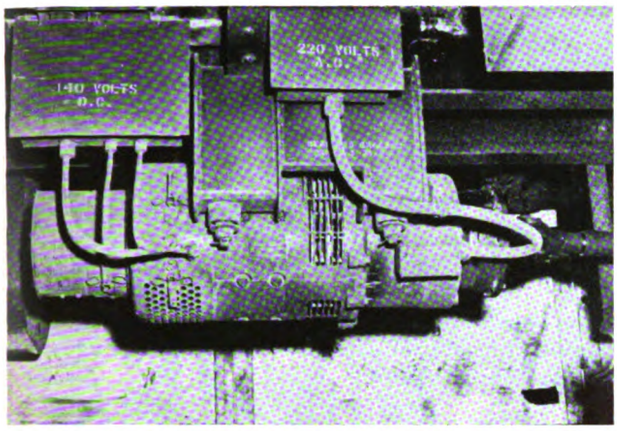
The control equipment includes an a-c panel, mounting line contactor, two overload relays, and an unloading relay. The d-c portion of the control equipment consists of a panel mounting a line contactor, a voltage regulating relay, a current regulating relay, a reverse current relay and a fuse or overload relay. Also mounted on a d-c panel are miscellaneous resistors, capacitors and rectifiers for control and stabilizing circuits.

When the generator and exciter are not running, current is fed from the battery through rectifier RT3 to the exciter field. Rectifier RT2 blocks this current so that it will not flow to the generator. As the set comes up to speed, the exciter builds up and excites the generator field. Because the exciter field polarity is always the same, the exciter armature polarity will reverse with a reversal of rotation of the set. Since the generator field is directly across the exciter armature, the generator field will likewise reverse with set rotation. Since both rotation and field current are reversed, the generator polarity will remain the same. An armature reversing switch is therefore unnecessary.

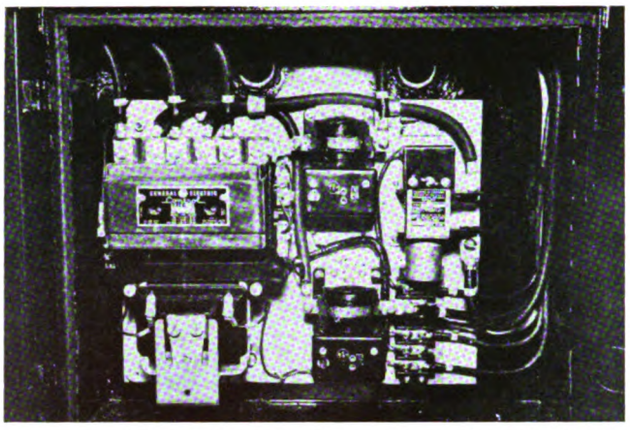
The reverse current relay is a simple two-coil relay having a series and a shunt coil wound on the same core. A knife-edge, counterbalanced armature carries the moving contacts. The fixed contacts are carried on a finger block which is mounted on the armature stop. There is one normally open circuit, the only purpose of which is to energize and de-energize the coil of the generator contactor. The only adjustment on the reverse current relay is a drop-out screw mounted on the armature.

As long as the generator voltage is higher than the battery voltage, the series coil of RC aids the shunt coil. When reverse current flows, the series coil bucks the shunt coil. This causes RC to drop out and open the generator contactor.

The voltage regulating relay (VR) has a single coil and a nonmagnetic armature. On the armature is mounted a movable contact bar which operates between two fixed contacts. Also mounted on the armature is a magnetic core plug that operates in the air gap at the center of the coil. A fixed core plug is mounted at the bottom of the air gap. The armature is held in its normal position by a spring. The adjustments of the movable core plug and the armature spring are sealed. The shunt coil is connected across the generator output in series with a resistor and rheostat. The rheostat is adjusted to set the relay to regulate the required battery charging voltage. The relay contacts are connected in the exciter field circuit.



The motor-generator set installed under a passenger car. Machines (left to right) are exciter, d-c generator and a-c motor



The a-c control panel is mounted in a box underneath the car

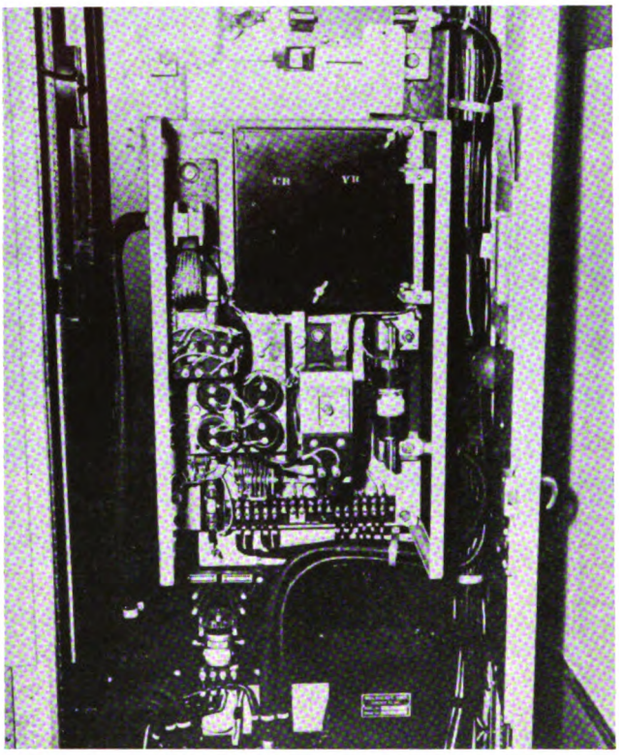
When the generator voltage rises to the value to be regulated, VR starts to pick up. This reduces the exciter field current and causes a corresponding decrease in generator voltage. VR then drops back to its original position. This action continues and the relay vibrates on its normally closed contacts. As the generator speed increases, the VR relay operates more in the open position than in the closed, and finally the contacts move to the other side and vibrate against the normally open contact.

The current regulating relay (CR) is similar in construction to the voltage regulating relay. It has two bias coils and a coil connected in series with the generator output. Again, the core and spring adjustments are sealed. When the line current reaches a predetermined value, the CR relay picks up and reduces generator voltage. This drops out VR. CR then takes over the operation of the system. Relay CR then vibrates against its stationary contacts to hold the proper amount of current.

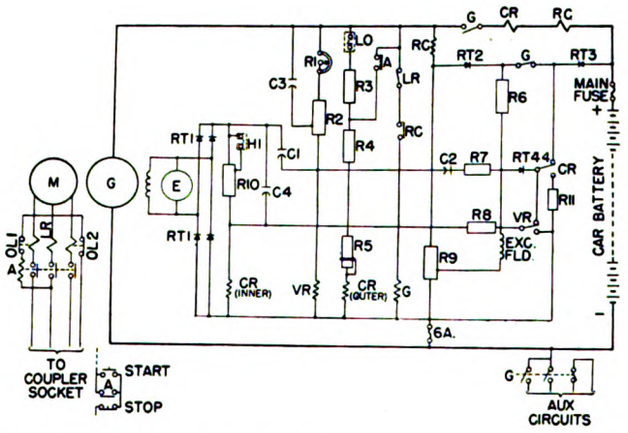
Rectifier RT1 provides for a constant polarity supply of exciter output voltage to the CR inner bias coil. As speed increases, exciter voltage decreases and current through the CR bias coil decreases, and the series current required to operate CR increases. This provides an increased generator current limit setting to take advantage of increased ratings as speed rises. Similarly, the CR outer bias coil, through an a-c line contactor interlock, adjusts the CR relay to a special wayside power current limit setting to protect both the a-c motor and the wayside power facilities.

Several stabilizing circuits are provided to give satisfactory operation over the complete range of speed and load. These circuits prevent hunting of the regulating relays and subsequent instability in the generator output. In short, when sudden system changes occur, the stabilizing circuits act to oppose the changes. Whether under steady state or transient conditions, the voltage and current regulating relays must be stabilized so that the moving contact will vibrate continuously against the fixed contact.

The equipment is designed as far as possible with an eye to the future. Current coils in particular are rated for use with low and high capacity generators. High and low settings of current limit are provided so that the same panel may be used with different generators. Devices have been selected to include as many common parts as possible for each of three voltage ranges.



The d-c control panel is mounted in a locker at one end of the car where it is readily accessible for inspection and adjustment



Simplified diagram of connections

This new design is largely a design of circuitry. To a great extent it has been possible to use proved circuit components. Because of the amplification provided by the exciter, the regulating relay contacts are applied at a volt-ampere level considerably below their rating. Capacitors and rectifiers, in particular, have been chosen conservatively to assure long life.

The low level of control power results in low temperature of the control locker and adds to the life of all equipment mounted in it.

As the regulating relay adjustments are sealed, the possibility of tampering and consequent maladjustment of the system is removed.

Design is such that individual components can be tested separately and installed without needing a system test.

The complicated voltage regulator has been replaced by two simple relays. These have a total of two double throw contacts instead of 20 contacts, and weigh only about 1/6 as much as the former regulator.

The armature reversing switch has been eliminated.

Shaft pressing tonnages have been greatly reduced.

Available speed ranges have been increased.

In brief, the equipment is characterized by simplicity, with expected long life and minimum maintenance.

A total of well over 100 of the new equipments have been delivered to several major railroads. Many of these have had months of operation and are providing reliable and satisfactory service.

From the Diesel Maintainer's Note Book . . .

Like a Man Lost in a Strange Forest

By Gordon Taylor

■ There are two methods of locating and correcting diesel troubles. By the first method you just start out trying this or that in the hope that you will do something that will somehow or other correct the trouble. That is the way that an Indian medicine man treats his patients. This method is not dependable. You are like a man lost in a strange forest without a compass. You are working in circles and need a compass to direct your efforts.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

In the case of diesel troubles, such a compass is a studied plan of action. In the second method, you use such a compass and carefully consider the symptoms of trouble. You think what you would do to cause the locomotive to act as it is acting. Then you plan your action to clear up the causes of that particular type of failure. If you are as familiar as you should be with the causes of different types of failures, you will find method No. 2 to be successful. The following is offered as a good example of trouble shooting by means of a studied plan of action.

What Happened

A three-unit EMD freight diesel was going about its business when the trailing unit failed to pick up load and it was a case of reducing load and setting out part of the train, or correct the trouble.

When the unit failed, the engine speed dropped to idle in throttle positions *2*, *3* and *4*. The engine would stop when the throttle was moved to Run *5* or Run *6*.

The crew started the engine up after it stopped, but could not get the speed up above idle speed. After trying this several times and losing time, the nearest round house point which fortunately was only twenty miles away.

As near as can be learned, the crew had checked the jumper cable and ground relay, but when they failed to correct the trouble, the crew needed help which they wisely called for.

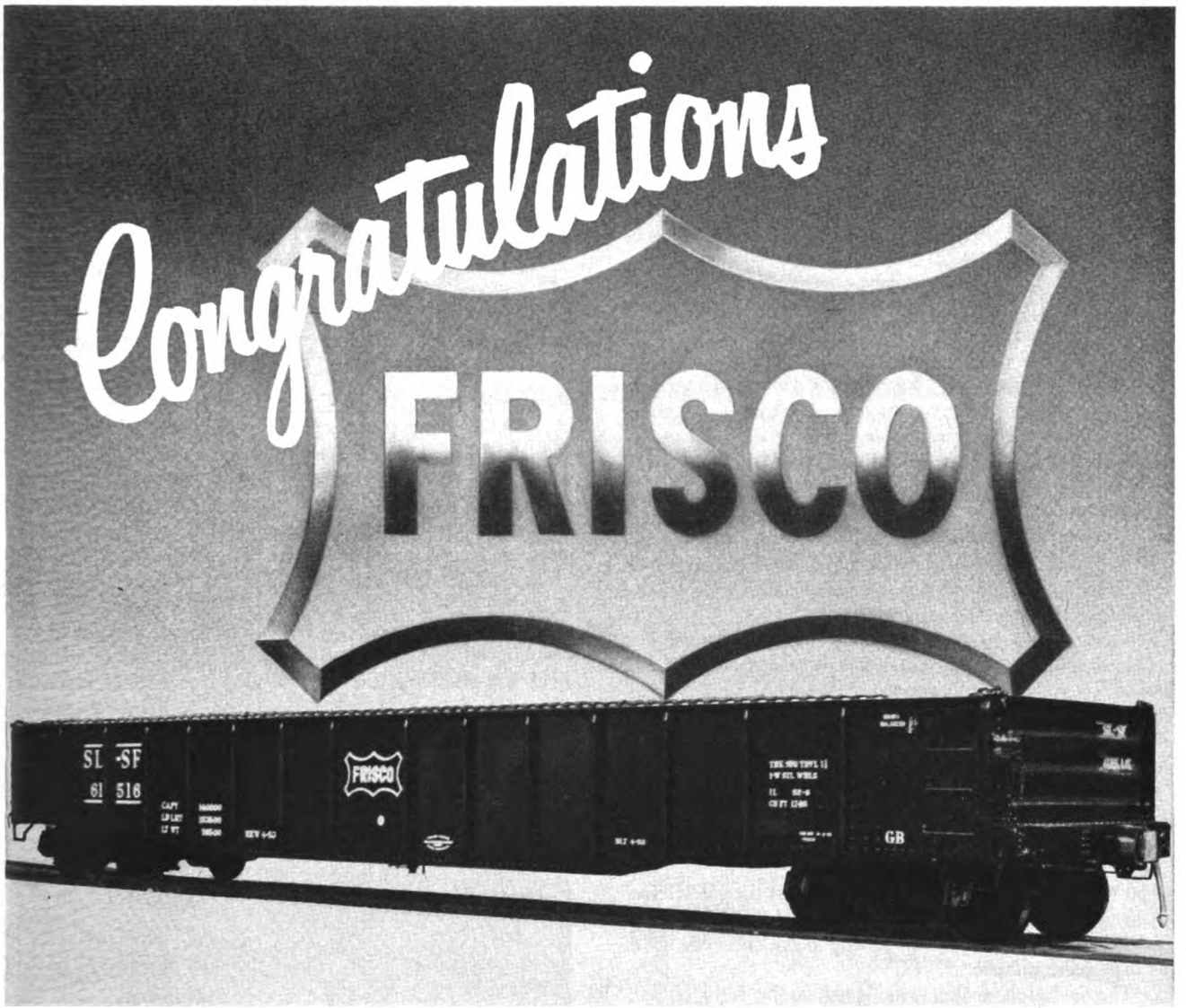
When the maintainers arrived, they checked the symptoms of the trouble and in five minutes the locomotive was on its way again. The electrician followed a studied plan of action which quickly solved the problem. Here is how he went about it:

Problem: What causes an EMD engine to go to idle speed in Runs *2*, *3*, *4*, *7* or *8*; and what causes it to stop in Runs *5* or *6?*

Experience and study told the electrician that the *ER* relay was involved, for it is the function of that relay when de-energized to cause the engine speeds to act as they were acting.

Next Question: What could be causing the *ER* relay to be de-energized? The ground relay could have caused *ER* to open, but a quick check showed the ground relay

(Continued on page 104)



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to be okay. The next thing was to consider all of the usual causes of a de-energized *ER* relay.

The functions of the *ER* relay as outlined in Operating Manual are as follows:

The *ER* relay on EMD units is located inside the engine control and instrument panel in the engine room.

It receives its orders to close from the no a-c voltage relay. It receives its orders to open from the ground relay, but its action may be interfered with by defective contacts in various parts of the control circuits.

Function of the ER Relay

For operation of the speed control in any one unit, the *ER* relay must be energized and closed. The relay has contacts which open when the relay is de-energized and they interrupt the circuits supplying the *A*, *B*, and *C* solenoids of the governor speed control. It has no effect on the circuit to the *D* solenoid. Thus, de-energizing the *ER* relay will cut out the *A*, *B*, and *C* solenoids and bring the engine to idle speed if the throttle is in runs *2*, *3*, *4*, *7*, or *8*. Should the *ER* relay become de-energized when the throttle is in run *5* or run *6*, the *D* solenoid will remain energized and cause the engine to stop.

The *ER* relays in the individual units are normally energized and closed by current received from the *FP* wire which runs throughout the locomotive. This wire is energized through the *PC* switch (or relay), fuel pump switch, and fuel pump fuse. The *ER* relay in each unit will become de-energized from any of the following causes:

1. Isolation switch not fully in *Run* position.
2. Failure of alternating current supply causing no a-c voltage relay to open.
3. Ground protective relay tripped.

The above three items were the ones that the electrician had to consider to get the engine speeds back to normal.

1. The ground relay had already been checked, so it was out of the picture.
2. The isolation switch was found to be fully closed. That dropped it out of the picture.
3. The no a-c voltage relay was checked. It was found to be closed, but the *AB* interlocks on it were burned and dirty. The interlocks were cleaned and the unit was back in business, all in the space of five minutes after planned action got to work.

Lesson to Be Learned

In discussing this case, the question was asked if it would have been permissible to simply block the *ER* relay closed. The answer is no. We do not want to start a practice of blocking relays that fail to operate in a normal manner. The idea is to restore them to normal condition. Suppose you blocked the *ER* relay closed. You would immediately lose the protection that ground relay is supposed to give. Also, you would lose the protection that the no a-c voltage relay gives.

Without these protective relays, heavy damage might result to traction motors and to engine.

There are many things that cause a diesel unit to drop load. Had the engine speeds remained normal, the most likely cause would have been some interference with excitation of the main generator.

Since the engine speeds were erratic the trouble was clearly not due to failure of generator excitation and thus called for a study of what causes an EMD engine to drop speed in runs *2*, *3*, *4*, and stop in runs *5* and *6*.

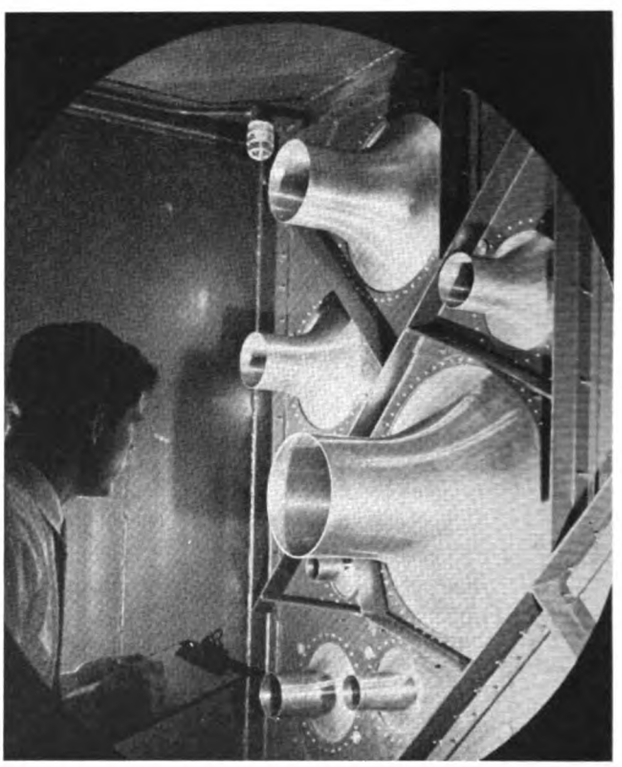
It is a lot more interesting to locate trouble by planned action, than it is to wander around in circles hoping that something favorable will happen.

Eliminating Shaft Currents

By W. E. Warner

■ The presence of local currents in shafts is often the cause of bearing trouble. The shaft is partially insulated by the oil film in the bearings. This is likely to break down, allowing induced or leakage currents to flow, which will cause pitting of the shaft, bearings and any connected gears. These currents are difficult to detect as they are only present when the machine is running.

The shafts can be grounded to the frame of the machine by means of a piece of springy steel. This has a hole drilled in one end, the other being welded to the machine frame. The steel is welded so that it extends over the shaft. In the hole in the free end is placed a piece of graphite brush, shaped to fit the hole firmly, which bears on the shaft. The springiness of the steel will insure good contact and good grounding.



Not tail pipes for moon rockets but calibrated air nozzles used in the General Electric Locomotive and Car Equipment plant laboratory to find ways of increasing the output of traction equipment within the design and size limitations of a locomotive. The nozzles and chamber are used as a part of a continuing study of air flow requirements of locomotive motors and generators and the effectiveness of different fan and blower designs

a number of shops on frisco lines now using paxton-mitchell safe-n-ezy washer-oilers

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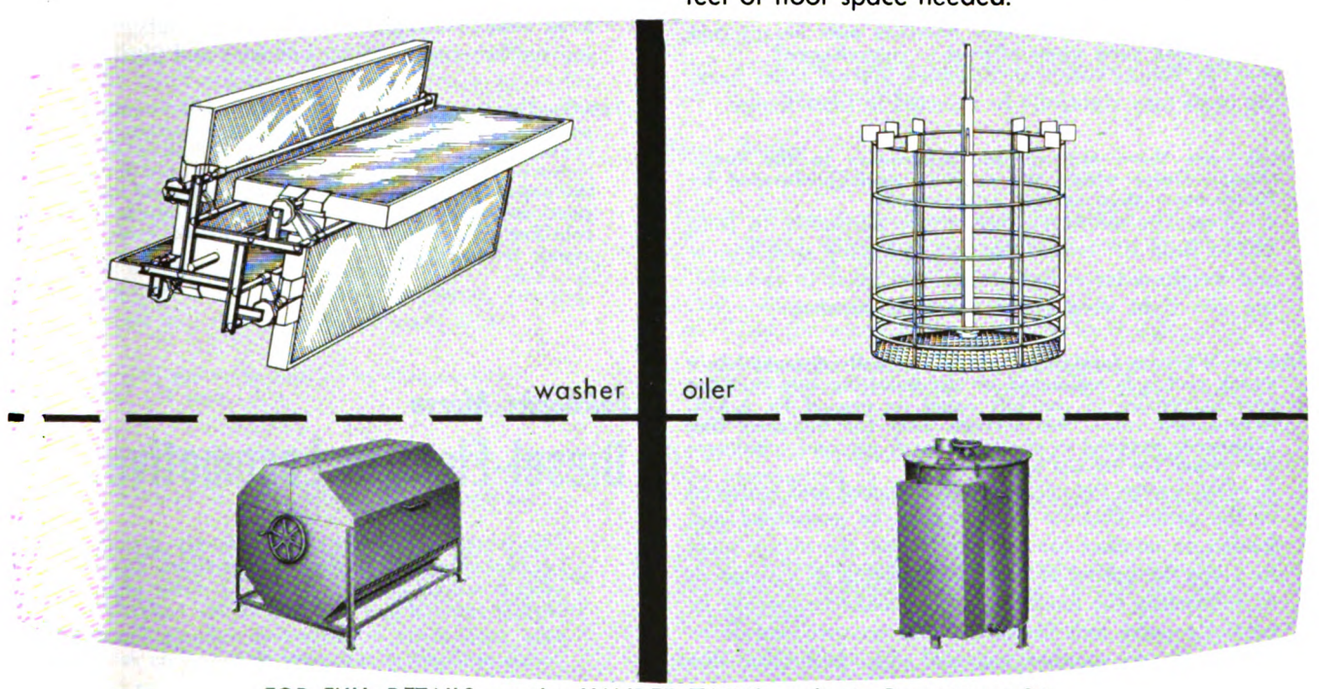
WASHER TAKES ALL filters up to 4" x 24" x 33". The oiler basket holds four filters up to 2" x 20" x 33"; three in sizes up to 4" x 24" x 33". Clips hold odd-size filters.

THE HAND-OPERATED WASHER is aided by roller bearings. The oiler, (also roller-bearing equipped), is started by hand; compressed air does the rest, including stopping. One non-skilled worker can operate both machines. Only 30 square feet of floor space needed.



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Questions and Answers

Interchange Rules

This is the fifteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

160-Q—What important freight car details now require either outright A.A.R. approval in some form or the issuance of specific A.A.R. Certificate of Approval before they can be used on cars which are intended for interchange service?
A—Metal running boards, draft gears, journal box lids, journal roller bearing grease, draft gear retainers and locks, brake beam and bottom rod safety supports, truck bolsters, truck side frames, coupler yokes and brake beams. Also, on and after January 1, 1956, automatic type slack adjusters which car owners elect to apply to interchange cars must be covered by Certificate of Approval.

161-Q—Is it generally intended that freight cars equipped with journal roller bearings shall be acceptable in interchange?
A—Yes. See note following Paragraph (j-1) of Rule 3.

162-Q—Are there any conditions under which cars equipped with journal roller bearings may be rejected by receiving road when offered in interchange?
A—Yes. Empty cars with defective journal roller bearing units may rightfully be rejected in interchange.

163-Q—Are there any specific allowances in the Interchange Rules where the cost of work performed by forces other than carmen is included?
A—Yes. The major portion of the allowance in Item 163 of Rule 107 covers the cost of having switch crew and weighmaster re-lightweigh cars prior to restenciling new light weight, etc., done by carmen.

164-Q—Where a foreign freight car is badly damaged in a wreck and it is estimated by the handling line that the cost of repairs to car will equal or exceed its A.A.R. depreciated value, less salvage, may the handling line arbitrarily proceed to dismantle such car and reimburse the owner for its net value?
A—No. Unless the car is totally wrecked and scattered to the extent that its parts cannot be assembled and loaded on another car and sent home, the owner must be given the option of either authorizing its retirement or requesting the handling line to make temporary or partial repairs and forward home on own wheels or load same on another car and ship home for disposition.

165-Q—Where handling line arranges to make temporary or partial repairs to a wrecked foreign car so it can be sent home on its own wheels, why is it important that proper estimate be made as to whether cost of repairs will be less or more than its depreciated value, minus salvage?
A—Because an improper estimate could result in loss of legitimate charge by the handling road up to $60.00 for the temporary or partial repairs.

166-Q—Why is it important for any road to send a representative from headquarters to scene of all wrecks of any consequence who fully understands all of the provisions and requirements of Interchange Rule 112?
A—So as to provide the kind of advice to those handling and clearing the wreck which will result in proper reporting and disposition of all foreign cars involved and thereby save the handling line needless expense.

167-Q—Is a railroad subject to penalty in some form where it elects to operate a loaded foreign car to destination having a wheel which has just reached the condemning limit for out-of-round or worn flange as outlined in Rules 73 and 74, respectively?
A—No. While also intended for guidance in the matter of safe operation of cars in trains as well as preventing undue wear on cars, the specific condemning limits for wheels as outlined in Rules 73 to 81, inclusive, need be strictly observed only where wheels are removed from foreign cars and bills therefor rendered versus car owners.

168-Q—What items of light repairs are generally made to freight cars in transportation yards by car inspectors?
A—It depends to some extent on the number of tracks which remain unaffected by switching operations for certain periods. However, in yards where conditions are favorable for such work and time will permit, items such as the following are renewed or applied: brake shoes, brake shoe keys, brake hangers and pins, brake head wear plates, air hose, air hose gaskets, cotter keys, journal bearings, coupler knuckles and pins.

169-Q—In view of the fact that Rule 101 requires the repairing road to allow the car owner certain credit percentages for various designs of defective draft gears removed, both approved and non-approved types, would the repairing roads be obliged to utilize all reclaimable portions of all such removed gears in definite draft gear rebilling programs in order to break even on their repair transactions?
A—Yes.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F165-Q—What is the trip setting?
A—The trip is set for approximately 950 rpm.

(Continued on page 111)

(Continued from page 106)

Fan and Shutter Controls

F166-Q—Where are the fan and shutter control switches located?
A—The control switches are sealed and located in a box on the left side of the wall near the engine room side door.

F167-Q—Where are the fan contactors located?
—The fan contactors are in two boxes located one near each engine room side door on the floor.

Sander Relay Valve and Cut-Out Cock

F168-Q—Where are these devices located?
A—Front truck sander relay valve and cut-out cock are located on the right engine room disc wall near the floor opposite the main generator. Those for the rear truck are located just ahead of the rear right sand box in the engine room aisle.

Hand Brake

F169-Q—Where is the hand brake located and where is it connected?
A—In the right rear of the unit and connected to the right rear brake cylinder of the rear truck.

Governor

(Bulletin 1706—101-A, page 27)

F170-Q—What type engine governor is used on these units?
A—The engine governor is of the Woodward Type P.G.

F171-Q—What are the features of this governor?
A—Electro-hydraulic speed control; built-in engine low oil pressure shut-down protection; built-in load regulator controlling resistance in exciter battery (4 pole) field; speed and fuel indicator scales on governor housing; overriding solenoid used to send load regulator to minimum field during wheel slip.

F172-Q—What does the governor speed control utilize?
A—Four solenoids, designated A, B, C, and D.

F173-Q—How are the solenoids energized?
A—Through four control train line wires running from the lead unit throttle through each unit.

F174-Q—How are the train line wires designated?
A—AV, BV, CV and DV.

F175-Q—What solenoids are energized at each throttle position?
A—Consult the table as shown at top of page 28.

F176-Q—How does the governor react to low lube oil?
A—If engine lube oil pressure falls below a pre-set amount for each engine speed, the governor will stop the engine.

F177-Q—What are the indications of the above condition?
A—Alarm bells will sound on each unit of the locomotive. The yellow "low oil" and blue "alternator failure" alarm lights will show on the engine control panel of the unit affected.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G164-Q—What must be done before the engine can again be started, once the overspeed device is tripped?
A—It must be reset manually (by pulling the lever counter-clockwise until it latches).

Load Regulator

G165-Q—Where is the load regulator located?
A—Diagonally below the engine control panel.

G166-Q—What controls the movement of the load regulator?
A—Movement of the load regulator is controlled by engine lube oil directed the load regulator pilot valve and a dump valve (ORS) in the engine governor.

G167-Q—What is the function of the load regulator?
A—To automatically vary the battery field strength in the main generator.

G168-Q—What is the result of this action?
A—This action results in maintaining a power output corresponding to a definite rate of fuel consumption as determined by the position of the throttle.

G169-Q—What is the indication when the load regulator is in minimum field?
A—When the load regulator is in minimum field, the brush arm is in the 4 o'clock position.

G170-Q—What is the indication when maximum field is obtained?
A—Maximum field is obtained with the brush arm in the 8 o'clock position.

Hand Brake

(Manual 2310, page 120)

G171-Q—Where is the hand brake located?
A—Against the side of the car body near the air compressor in both A and B units.

G172-Q—How do you set the hand brake?
A—Turn the wheel clockwise as far as it will go.

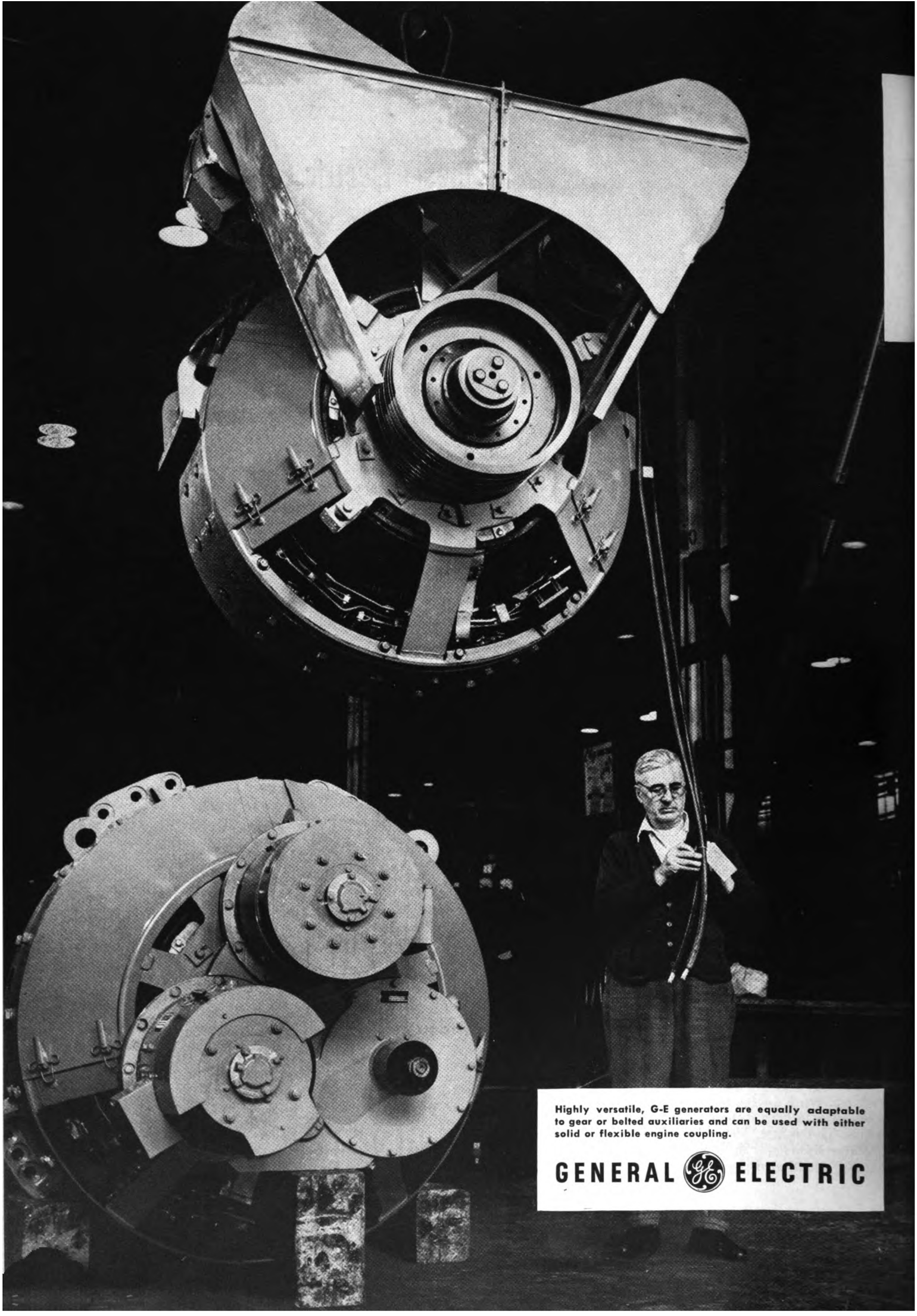
G173-Q—How do you release the hand brake?
A—To release the brake, rotate the wheel counter-clockwise against the friction locks.

G174Q—What precaution must be taken before moving the locomotive?
A—Be sure that the brakes are completely released on all units.

G175-Q—When should the hand brake be applied?
A—Whenever anyone is working around the locomotive trucks.

Control Air Pressure Regulator

G176-Q—What is the function of the Control Air Pressure Regulator?
A—To reduce the air from main reservoir to 903 lbs "control air" for operating power contactors, reverser and cam switch.



Highly versatile, G-E generators are equally adaptable to gear or belted auxiliaries and can be used with either solid or flexible engine coupling.

GENERAL ELECTRIC

PERSONAL MENTION (*Continued from Page 23*)

ice engineer, Electro-Motive Division, General Motors Corporation 1937-41. In latter year became assistant to superintendent motive power, WP. Appointed assistant superintendent motive power in 1949, and assistant chief mechanical officer in December 1950.

Obituary

WALTER BOHNSTENGEL, who retired as chief test engineer for the Atchison, Topeka & Santa Fe on August 1, 1847, died at Topeka, Kan., last October.

GUSTAF A. OLSON, retired shop superintendent of the New Haven, died September 27 at his home in Chicago.

L. CLAYTON WALTERS, 64, assistant to vice-president, signal and electrical, of the Southern, died in Doctors Hospital, Washington, D. C., January 2.

SUPPLY TRADE NOTES

UNITED STATES STEEL CORPORATION, AMERICAN STEEL & WIRE DIVISION.—*Norman M. Sted* has been appointed assistant general manager of sales.

■

RAYBESTOS-MANHATTAN, INC., MANHATTAN RUBBER DIVISION.—*James Adams, Jr.*, has been appointed chief engineer, research and product design.

■

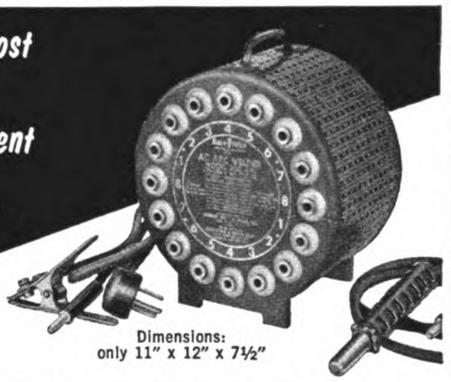
JOSEPH J. RYERSON & SON.—*Weaver E. Falberg*, assistant general manager of sales, has been appointed general manager of sales. *John A. Houston*, assistant

WORTHINGTON CORPORATION.—*Roland W. Bartlett* has been appointed manager of the Detroit district office. Mr. Bartlett was previously sales engineer in the company's Washington, D.C., district office.

■

EDGEWATER STEEL COMPANY.—Edgewater has opened a New York District sales office, in charge of *Daniel J. Mooney, Jr.*, district sales manager. Mr. Mooney formerly was with Great Lakes Carbon Corporation. *Scott Donahue*, whose sales agency has represented Edgewater in the New York area for many years, will continue in a sales advisory capacity.

ANNOUNCING . . . The most revolutionary achievement in ARC WELDING equipment in years!



BREN WELD MODEL 200 AW

Weighs only 65 lbs.— Carry it to the job!

Patent Pending

Dimensions: only 11" x 12" x 7½"

FIRST TRULY PORTABLE 200 AMP. OUTPUT ARC WELDER

OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING

List Price $169.50 F. O. B. Long Island City, N. Y.

Sensational new transformer development produces far more power to pound! The BREN/WELD does work of conventional welders 4 or 5 times its size and weight . . . Actually delivers up to 250 amps at reduced duty cycle.

Simple to use, fully guaranteed, it operates on 110/220 volts AC, 50/60 cycles; handles electrodes from 3/64" to 5/32". Has adjustable arc voltage for different arc characteristics. Ideal for plant production and maintenance, for construction work, railroads, on the farm or home.

See your dealer or write direct for details of free trial offer!

24 hour delivery from stock!

KASSON

Manufactured by BRENNEN, BUCCI & WEBER, INC. New York City

SALES DIVISION KASSON DIE & MOTOR CORPORATION Integrity Since 1919 32-14 NORTHERN BOULEVARD, LONG ISLAND CITY 1, N. Y.

FRISCO

like other leading American railroads keeps it clean with Air-Maze filters

AIR-MAZE The Filter Engineers

AIR FILTERS • SPARK ARRESTERS • LIQUID FILTERS SILENCERS • OIL SEPARATORS • GREASE FILTERS

25000 Miles Road, Cleveland 28, Ohio

Weaver E. Falberg

sales manager of the Chicago plant, succeeds Mr. Falberg as assistant general manager of sales.

■

TIMKEN ROLLER BEARING COMPANY.—*D. G. Gibson,* assistant district manager, Dallas territory, has been appointed district manager, succeeding *Harry Trump,* deceased.

■

KERITE COMPANY.—*Theodore O. Rudd* has been elected president succeeding *C. R. R. Harris,* who has become chairman and chief executive officer, also retaining his post as treasurer.

Mr. Rudd joined the company in 1926 as a sales engineer. He was appointed to

Theodore O. Rudd

department manager in 1941, and named vice-president in 1945, and became a director in 1946.

■

NEW YORK AIR BRAKE COMPANY.—*Thomas W. Johnson* has been appointed director of engineering for the five divisions of New York Air Brake. Mr. Johnson was previously assistant to the executive engineering consultant.

■

JOSEPH DIXON CRUCIBLE COMPANY.—*H. E. Ehlers, Jr.,* industrial sales manager, has been appointed general sales manager. Mr. Ehlers has been succeeded by *R. C. Brock,* Pacific Coast district manager, who, in turn has been succeeded by *D. C. McMillin,* sales representative at San Francisco.

■

BEAVER PIPE TOOLS, INC.—*Charles T. Everett* has been elected president and general manager, as well as a director. Mr. Everett, before becoming associated with Beaver on May 15, 1954, as executive vice-president and general manager, was vice-president of the Bingham-Herbrand Corporation.

■

NATIONAL MALLEABLE & STEEL CASTINGS COMPANY.—*Roy C. Hobson,* assistant manager, has been appointed manager of the Chicago plant, and *Allan S. Bixby,* assistant manager, has been appointed assistant manager of the Mel rose Park plant.

■

INTERNATIONAL NICKEL COMPANY.—*Albert P. Gagnebin* has been appointed assistant manager of the Nickel Sales Department and *Edward B. Bitzer,* assistant manager of the Nickel Alloys Department, both at New York. *Keith D. Millis* has been placed in charge of the Ductile Iron Section of the Development and Research Division at New York, succeeding Mr. Gagnebin, and *Howard N. Farmer, Jr.,* has joined the division as a member of the West Coast Technical Field Section at Los Angeles.

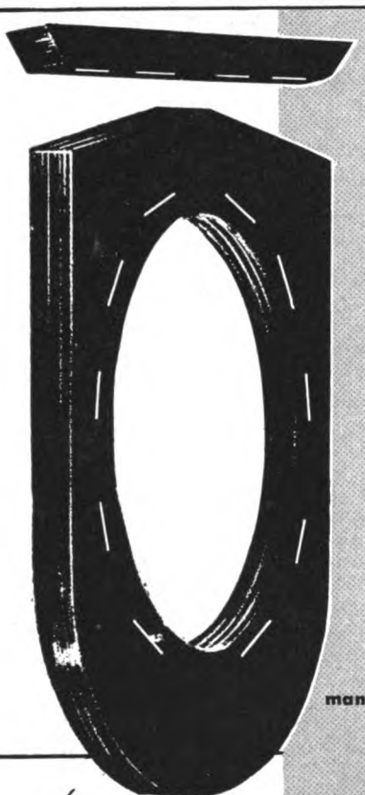
■

SUPERHEATER COMPANY, RAILROAD DIVISION.—The name of the Superheater Company Division of Combustion Engineering, Inc., has been changed to the Railroad Division of Cumbustion En-

FRISCO

Congratulations to the

F R I S C O Mechanical Department



JENKINS

leather *fibre

JOURNAL BOX DUST GUARDS

Used on the FRISCO for over 20 years

Changes in the 1955 code of A.A.R. Interchange, Rule 66, paragraph B, prohibit the use of wooden dust guard plugs.

Specify

JENKINS Leather Fibre Dust Guards and Wedges

manufactured by

THE GEORGE O. Jenkins COMPANY

Distributed exclusively by

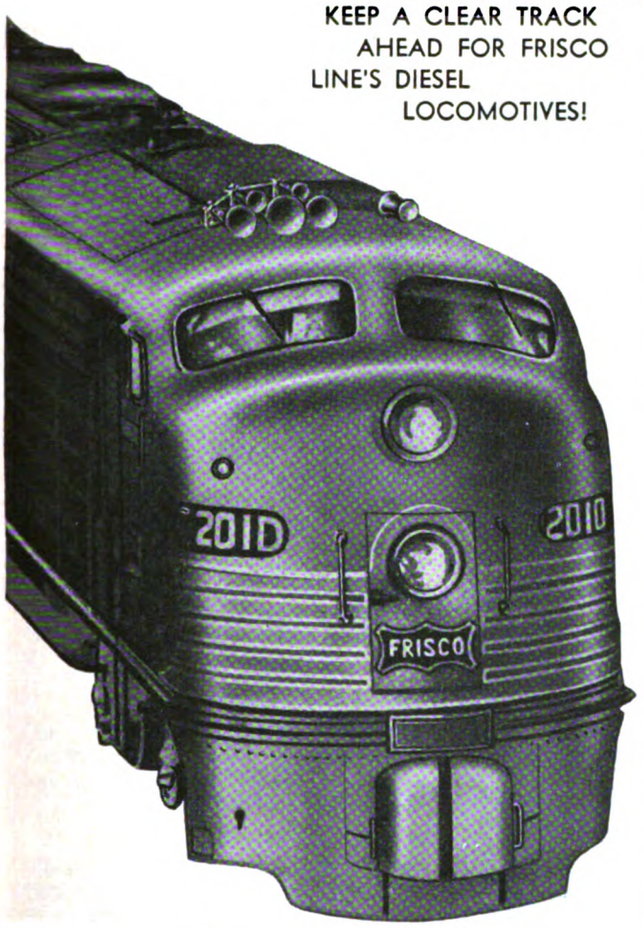
EQUIPMENT RESEARCH CORPORATION

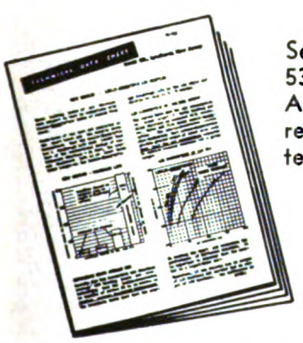
64 E. JACKSON BLVD. CHICAGO 4, ILLINOIS

Agents in all principal cities

180 LESLIE-SUPERTYFON AIR WHISTLES ARE OUT IN FRONT FOR ONE OF AMERICA'S GREAT RAILROADS

LESLIE-SUPERTYFON 5-CHIME AIR WHISTLES KEEP A CLEAR TRACK AHEAD FOR FRISCO LINE'S DIESEL LOCOMOTIVES!





Send for Technical Data Sheet 531 describing Leslie-Supertyfon Air Whistles—performance, and results of diaphragm breakdown tests.

LESLIE® SUPERTYFON

3403

LESLIE CO., 275 Grant Avenue, Lyndhurst, New Jersey

NEW TOLEDO VISE STAND

a Sturdy Lightweight Work Bench!

BUILT-IN TRAY folds for easy carrying

Handy new Toledo No. 8 Vise Stand goes to any pipe-fitting job easily . . . sets up or takes down quickly . . . saves time and effort. All one unit, no loose parts. Extra rugged, won't fold up in use. Large size vise base for easy mounting of Toledo or other vises. 3 pipe benders, plenty of tool slots, pipe rest, ceiling brace. See it now—a great value at your supply house!

NEW TOLEDO PIPE VISE

Exclusive ROCKING-WEDGE ACTION JAWS

Small Pipe from ⅛"

Larger Pipe to 2½"

Tees, Ells Valves

Grips any shape without crushing. Jaw action tends to eliminate marking of pipe. Heat treated jaws. Capacity—No. 1 Vise, ⅛" to 2½". Order through your supplier.

THE TOLEDO PIPE THREADING MACHINE CO.
Toledo 4, Ohio

"TOLEDO" TRADE-MARK REGISTERED U.S. PAT. OFFICE

Builders of the World's Finest Pipe Tools

PIPE THREADERS
PIPE WRENCHES
POWER PIPE MACHINES

gineering, Inc. with offices in the Bankers Building, Chicago 3, and 200 Madison avenue, New York 16. *S. L. Brownlee*, who was manager of sales for the former Superheater Division, is now manager of the Railroad Division, with offices in Chicago.

■

ELASTIC STOP NUT CORPORATION OF AMERICA.—*D. E. Lally*, assistant general sales manager, has been named general sales manager, succeeding *E. F. Nason*, who has been made administrative assistant.

■

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*W. E. Olds* has been named vice-president—sales, succeeding *J. E. Vaughn*, deceased.

W. E. Olds

H. L. Kent and *Arthur A. Franks, Jr.*, have been appointed assistant vice-president-district sales manager, of the Eastern district at New York and the Western district at Chicago, respectively.

■

JOY MANUFACTURING COMPANY.—*J. D. Russell*, manager of engineering, has been appointed vice-president of engineering, with headquarters in the Oliver building, Pittsburgh.

■

CHICAGO FREIGHT CAR & PARTS CO.—Under a new plan for the purchase and leaseback of freight cars the Chicago company would agree to purchase outright from a railroad or private car line any series of standard freight cars which are bad ordered or in need of periodic repairs, or cars for which no work funds are available. Cars so purchased would be repaired, either in the Chicago company's shops or in the road's own shops. In either case the company would pay the cost of such repairs. Repaired cars would then be leased back to the road from which they were purchased. They would carry the railroad's name and reporting marks.

Daily rental charges for the cars would be determined in each case by their cost to the Chicago firm, the amount of repairs required and the length of term of the lease. The firm believes such charges would be, as a general rule, substantially below the daily per diem of $2.40.

Once the cars have been leased back to the railroad, and placed in service, the carrier would have normal control over their use. All per diem and other earnings would accrue to the railroad.

The Chicago firm states that sale of bad-order cars by a railroad would provide new funds immediately for other uses. Rental charges, meanwhile, would constitute a direct operating expense and could be charged off against current earnings.

Obituary

WILLIAM CHARLES HANSEN, 60, president of A. Stucki Company, Pittsburgh, died on January 27 at the Johns Hopkins Hospital, Baltimore.

■

ERNEST W. DAVIS, director of engineering for the Simplex Wire & Cable Co., died on January 11 of a heart attack.

■

J. E. VAUGHN, 54, vice-president—sales of the Standard Railway Equipment Manufacturing Company at Chicago, died there December 20.

■

HARRY W. TRUMP, 63, southwest district manager of the industrial division of Timken Roller Bearing Company, died December 25 in Baylor Hospital, Dallas, Tex.

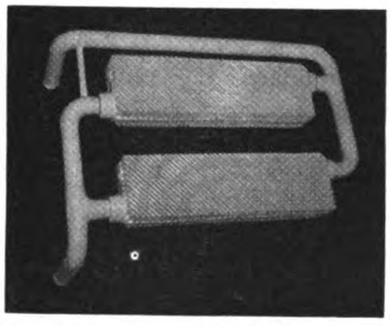
■

JOSEPH J. CIZEK, retired vice-president and sales manager of the Leslie Company, died on January 29 at Stuart, Fla.

FRISCO

Gets

EFFECTIVE AFTERCOOLING With WILSON Aftercoolers



Wilson Compressed Air Aftercooler

● The FRISCO Railway has equipped 24 of its newer diesel-electric units with Wilson Compressed Air Aftercoolers. As additional equipment, these rugged aftercoolers are mounted on roofs of the locomotive units—out-of-the-way, compact and performing with high thermal efficiency.

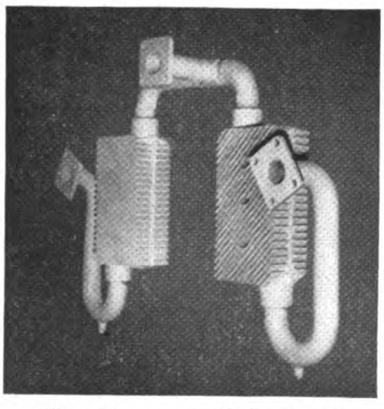
Wilson Radiation Elements are the heart of these aftercoolers. Integrally-cast in aluminum, these light-weight elements—with great inherent strength—offer exceptional freedom from maintenance and repair problems.

WILSON INTERCOOLERS

Wilson Compressed Air Intercoolers involve the use of the same radiation elements as described above. More than 1500 Wilson Intercoolers are in service today on locomotive units of 39 railroads—providing consistently reliable interstage cooling of compressed air for multi-stage compressors.

Especially severe these diesel-electric locomotive applications—yet *no Wilson Radiation Element has ever failed in service!*

Write for full information.



Wilson Compressed Air Intercooler

WILSON ENGINEERING CORPORATION

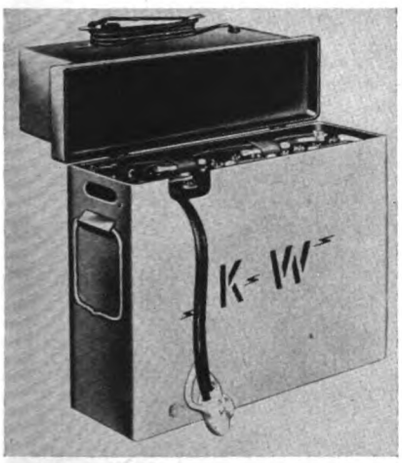
122 South Michigan Avenue, Chicago 3, Illinois

(*Continued from page 26*)

and silicone insulation is used on all coils.

The fully-automatic arc force control is offered as optional equipment and provides an extra surge of current to blast away short circuiting metal drops which would otherwise freeze a short arc and cause sticking. The unit is suitable for difficult work such as pipeline root passes, vertical welding, low hydrogen jobs where a short arc and deep penetration are required.

Cooling for coils and rectifier stacks is provided by forced-draft ventilating fans. Designated 6WR30B, it is available for 220/440- or 550-volt operation. *General Electric Company, Welding Department, York, Pa.*



Power Unit

A complete, self-contained power unit, with a permanently mounted charger on the battery, can be charged by plugging into any 110-volt, 60-cycle power outlet.

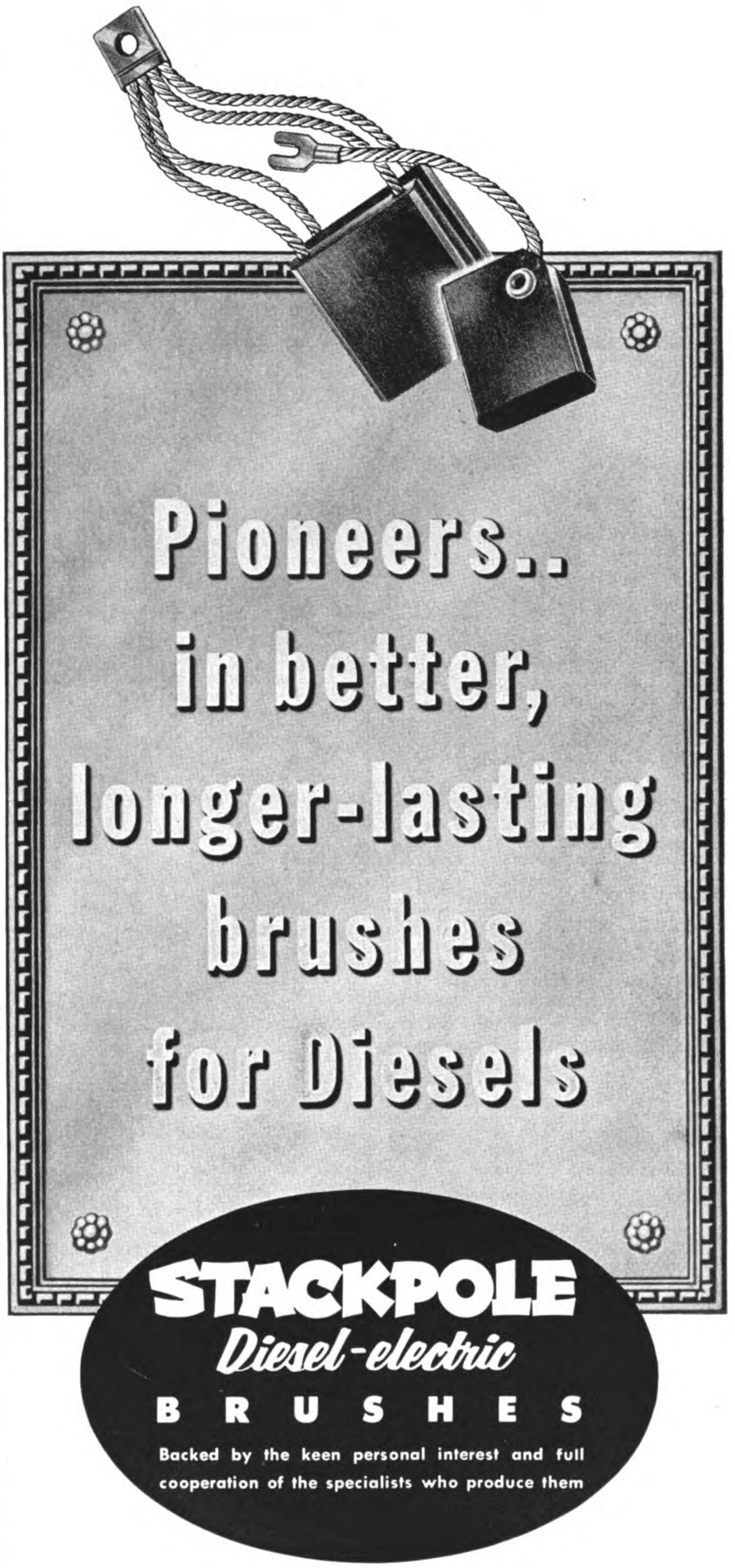
The battery remains on the truck and can be given a boost whenever the truck is not in operation. This battery charger can charge the battery overnight and be left on continuously without damage to the battery.

The top of the unit tilts back with the charger for easy access to the battery for adding water. The complete units are 26½ in. long, 7¾ in. wide and 30⅝ in. high. *KW Battery Company, Inc., Skokie, Ill.*

Vapor Degreaser

Extremely compact, this unit requires minimum floor space and is reported to eliminate costly handling so common to degreasing of small metal parts. The device is a high production unit in which any combination of degreasing cleaning cycles may be incorporated.

The Vibra-Degreaser is equipped with a conventional type hopper. Small parts to be cleaned are loaded into this hopper and parts are drawn into the degreaser by an



Manufacturers' Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. BATTERY CUBICLES. *Curtis Development & Mfg. Co.* 4-page 2-color bulletin (752) describes, illustrates and gives ratings for Curtis two-circuit battery charging and discharging cubicles for railway car lighting and air conditioning, diesel electric locomotives, and motive power service.

2. LOCOMOTIVE EQUIPMENT. *Viloco Railway Equipment Co.* 28-page laminated-finished-cover booklet describes and illustrates with in-action photos and diagrams the Viloco line of equipment for diesel, steam and electric locomotives—includes sander traps, valves, sand dryers, and lists of parts.

3. WATER TREATMENT. *Hall Laboratories, Inc.* 6-page pocket-size folder (290112) "Cooling Water" outlines the dangers of scale and corrosion in cooling system and organic contamination of cooling system water.

4. SAFETY EQUIPMENT. *E. D. Bullard Co.* 20-page Safety Equipment Catalog (55) gives data on all Bullard safety products with photos and technical details.

5. HEAT TREATING. *Metal Treating Institute.* 16-page booklet "Cost Accounting for Heat Treating" is a complete report of the MTI Cost Accounting Committee's efforts to develop a basic cost system adaptable to all types of heat treating operations.

6. PACKINGS AND GASKETS. *The Garlock Packing Co.* 20-page catalog (AD-148) gives complete design information, recommended pressures, and available materials for both dynamic and static applications of Garlock O-Rings.

7. FORGED STEEL UNIONS. *Watson-Stillman Fittings Div. H. K. Porter Co.* 4-page bulletin (U-1) describes, illustrates and gives dimensions of the new W-S Forged Steel Unions, both the screw-end and socket-welding types.

8. AIR REDUCTION. *Air Reduction Co., Inc.* 36-page profusely illustrated booklet "Facts About Air Reduction" describes in easy-to-read style the products and services of the various divisions; includes a history of the company, the process of reducing air, distribution facilities, and an organization chart.

9. JACKS AND PULLERS. *Templeton, Kenly & Co.* Bulletin (RR55) describes and illustrates the Simplex line of mechanical and hydraulic jacks and pullers, including trailer jacks and hold-down units for piggyback operations.

10. REFLECTIVE MATERIAL. *Prismo Safety Corp.* 4-page booklet (R-754) gives complete details on Prismo reflective marking materials and the Rain-Pruf Reflecto-Kit; includes in-use day and night photos, and application details.

11. MICROWAVE RADIO SYSTEM. *Westinghouse Electric Corp.* 8-page booklet (B-6393) gives a complete description of 2000-mc microwave-radio systems; features discussion of Type-FR microwave radio and Type-FJ multiplexing equipment.

12. OVERHEAD CRANE. *Whiting Corp.* 12-page 2-color booklet (Unit 80) "Presenting Whiting Engineered Cranes Designed For Better Performance at Lowest Cost" gives a complete presentation of the wide variety of handling jobs performed by Whiting overhead cranes; installation photos show cranes in action.

13. ADJUSTABLE SHELVING. *Standard Pressed Steel Co.* 4-page catalog-punched folder (2057) with photos, cartoons and text presents the features of the Hallowell Adjustable Steel Shelving.

14. V-DRIVES. *Worthington Corp.* 100-page Master Engineering Manual on Multi-V-Drives With QD Sheaves (V-1400-E2F) presents a scientific and simplified method for rating V-belts; each popular 60 cycle motor speed with complete drive selections shown on separate page.

15. ABRASIVES. *The Carborundum Co.* 42-page pocket-size booklet (14) "Abrasive Grain and Powders", with informative charts and illustrations, contains many of Carborundum's latest abrasive engineering recommendations; includes suggested layout for set-up room.

16. GRATING & STAIR TREADS. *Dravo Corp.* 16-page booklet (1105) describes and illustrates the complete line of Tri-Lok Interlocked and Tri-Forges Welded grating and stair treads, includes tables of safe loads and application photos.

17. HOISTS. *Ingersoll-Rand Co.* 44-page catalog (5300-A) describes the full line of I-R air and electric hoists; includes specifications, capacities, sizes, symbols and accessories of each type and size.

Reader Service Department — **MARCH, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17

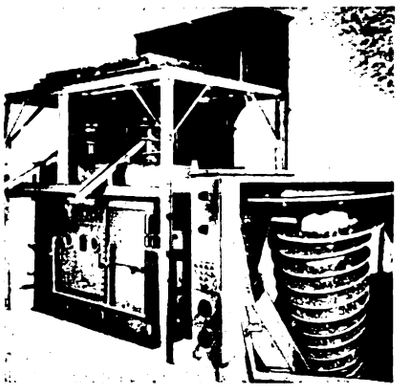
Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

Company .....

Address .....

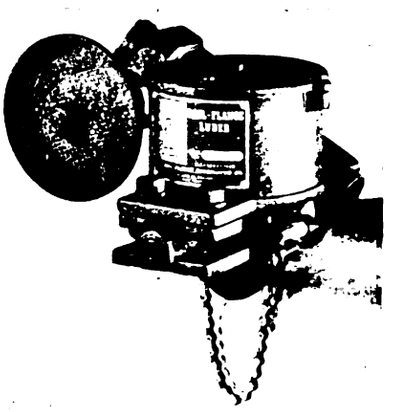
City ..... **Zone** .... **State** .....



electro-magnetic vibrating feeder onto a spiral elevator. This spiral elevator carries the work up through the cleaning cycle to the discharge point.

Moving parts such as chains, shafts, bearings, and sprockets have been circumvented in the design of the unit, eliminating wear and maintenance operations. Basic motive principal of vibration is claimed to maintain a constant flow of work into and out of the device, thereby eliminating overloading.

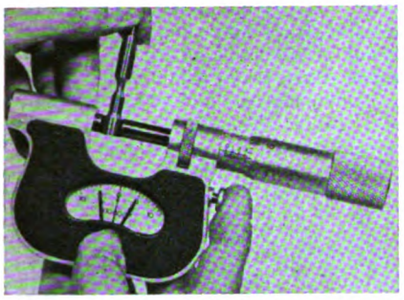
Solvent consumption is held to a minimum because the machine is totally enclosed. It is furnished with a complete control unit and requires either 220- or 440-volt, single-phase ac connections. It may be heated by either gas, steam, or electricity. *Manufacturers Processing Company, 1360 Hilton Road, Detroit 20.*



System Lubricator

A fully automatic lubricator which prolongs life of wheel flanges, switch points, frogs and rails for use on either diesel or steam locomotives, is designed to last for years with minimum maintenance. It is installed above the drive wheels and apply an accurately-controlled film of graphite-base lubricant to the throat of the wheel flanges by means of a slow-moving sprocket chain, powered by a friction type mechanism.

When utilized on a system-wide basis, sufficient lubricant is transferred from the wheel flanges to the pressure side of rails and to frog and switch points. By preventing "dry-steel", costly derails may be eliminated. *Rail & Flange Lubricator Co., 2784 N.W. Thurman street, Portland 10, Ore.*

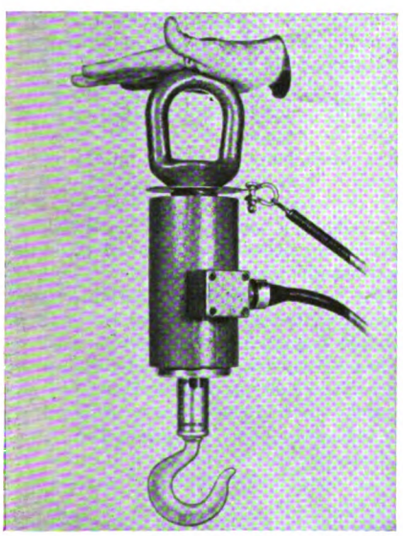


Indicating Micrometer

This device, said to provide "visible feel" to the user, has a range from 0 to 1 in., reading in 0.0001 in. in.rements. Readings of tenths are easily read from an extra large dial. The indicating mechanism controls the measuring pressure so that all uncertainties due to difference in feel of individuals are eliminated.

The Master Compar, as it is called, is a micrometer and comparator combined into one instrument. It also supplies the user with a complete set of Go and No Go gauges of 1 in. range, reading in 0.0001 in.

The unit is said to detect out-of-roundness, ovalness and taper. Resetting to zero is accomplished by means of a screw on the bottom of the housing and can be done accurately in less than 5 sec. Heavy tungsten carbide anvils and finished hardwood case are standard equipment. *George Scherr Company, Inc., 200 Lafayette street, New York 12.*

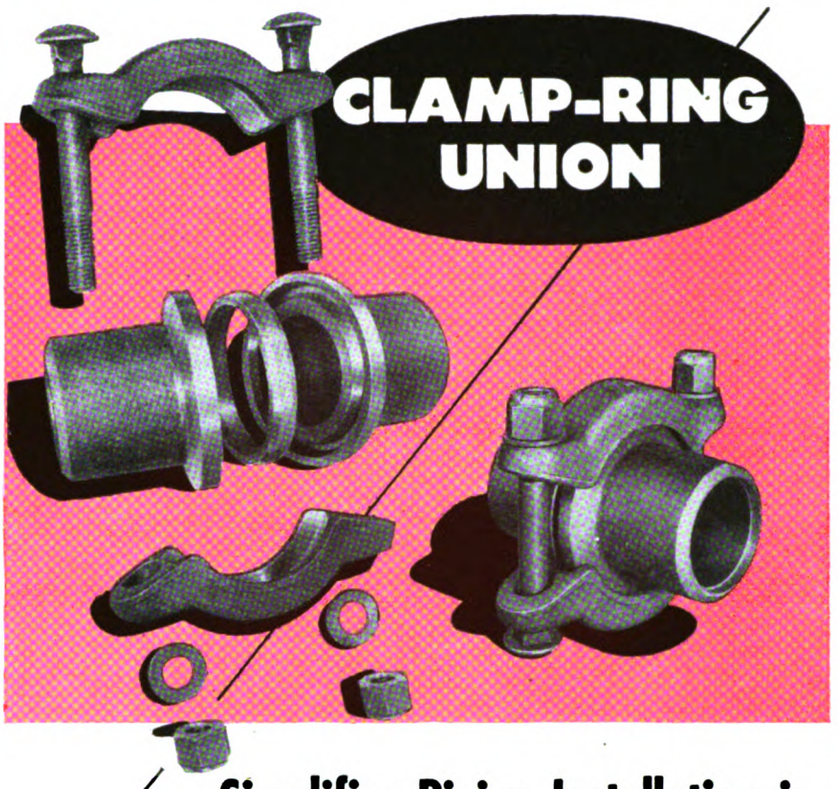


Crane Scales

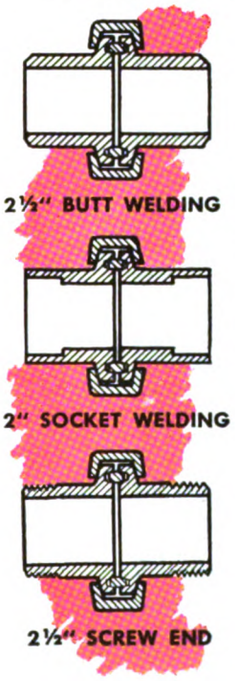
Addition of three new standard sizes of SR-4 crane scales in small capacities has been announced. The new sizes are ½ ton, as illustrated, the 1½ ton and 2½ ton units. The manufacturer's line, with these additions, now includes six sizes ranging from ½ to 25 ton capacities.

These direct-reading load indicating instruments may be mounted in crane cabs, on carts, or in stationary positions. Cable reels provide freedom of movement of crane

WATSON-STILLMAN



Simplifies Piping Installation in Locomotive and Car Heating Steam Lines



Here's the ideal union for locomotive and car heating steam lines. It is readily installed in those hard-to-get-to locations beneath the frame. The clamp can be rotated so that the nuts are in the most convenient position for gripping and turning with a wrench. The union allows the pipe to be pre-fabricated and completely installed in the car frame. When used to join valves with matching ring faces, the W-S Clamp-Ring Union permits easy installation and removal of valves, and allows them to be rotated to any convenient position.

The W-S Clamp Ring Union is presently available in two sizes... for 2" and 2½" IPS pipe. The 2" union has socket-welding ends, whereas the 2½" union is available with butt-welding or screwed ends. Other sizes are available on application.

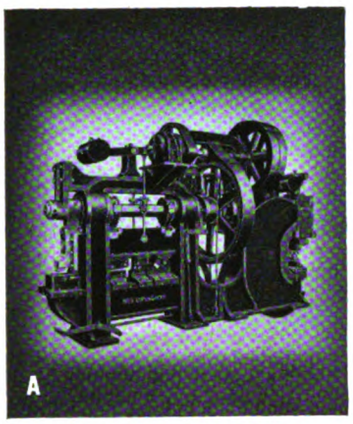
Sold through Leading Distributors

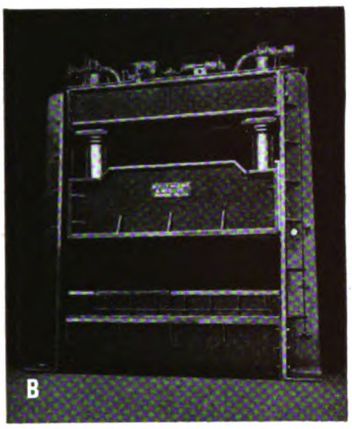
For information on the Clamp-Ring Union and other Watson-Stillman Railroad Pipe Fittings send today for Bulletin RR-1.

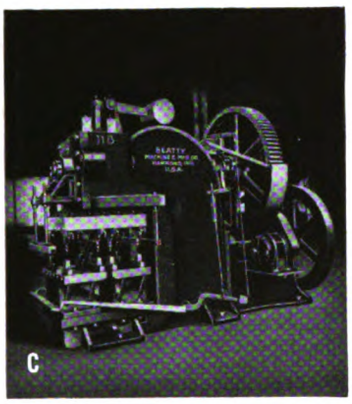
WS

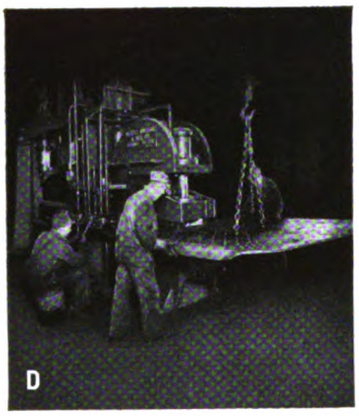
WATSON-STILLMAN FITTINGS DIVISION

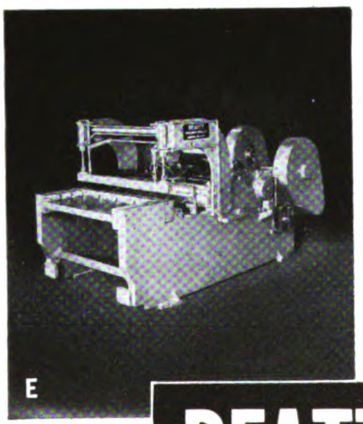
HKP **H. K. PORTER COMPANY, INC.**
Roselle, New Jersey R3











HERE'S TO:

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AND PROGRESS

We are pleased to join the entire railroad industry in saluting a pioneer line on the successful operation of their mechanical department. We are pleased, too, to even think that in some small way we may have contributed to their success and progress. Congratulations "FRISCO"!

A. BEATTY Co-Pun-Shear, one unit that does coping, punching and shearing without changing tools.

B. BEATTY Vertical Hydraulic Bulldozer for hot and cold pressing and forming of heavy metal.

C. BEATTY Heavy Duty Punch that handles steel up to 65 ft. long. Punches webs, and flanges.

D. BEATTY Press Brake and Flanger handles any type of bending, forming, flanging, pressing.

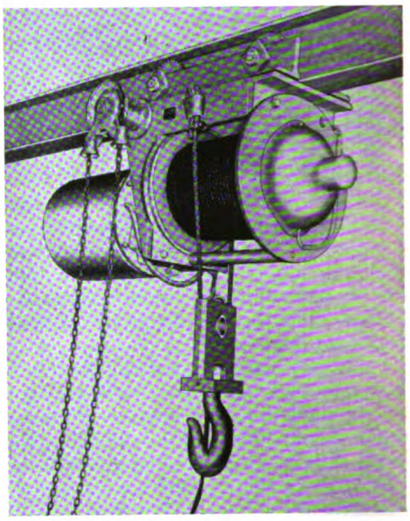
E. BEATTY Horizontal Multiple Punch for line punching of vertical flanges.

BEATTY

MACHINE & MFG. CO.

HAMMOND • INDIANA

scales. High overload capacity protects calibration of the load-sensitive units. Overall length of the scales ranges from 18½ in. for the ½ ton unit to 5 ft for the 25 ton unit. *Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.*

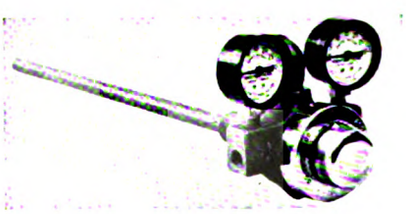


Heavy-Duty Electric Hoist

Headroom of these 8- and 10-ton hoists, designed to handle heavy lifts, is approximately 37 in. The lift height is 15 ft and up. A choice of four mountings is offered: plain-trolley, hand-geared trolley, motor-driven trolley, and lug mounting. The mechanical brake with which each is equipped is stated to be advantageous in safe precision control of loads in the capacity ranges. It is constructed integrally with the hoist motor and gear reduction and automatically engages two cone-shaped, metal friction surfaces when power is broken in the motor circuit.

If the operator desires to "inch" the load up or down, a succession of quick touches on the up and down buttons will place the load exactly where wanted.

The hoist motors are of variable speed with single-speed control. They are of squirrel-cage induction type. Rotors incorporate a heat dissipating ring for localizing the heat of high-slip operation. Hoists of any capacity above 10 tons can be ordered. *R. G. LeTourneau, Inc., Longview, Tex.*

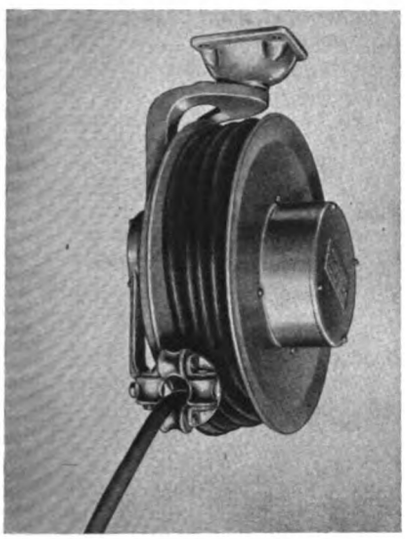


Thermostatic Pilot Controller

Unusually small in size, this controller is said to provide accurate temperature control of liquids or air when used in con-

junction with valves, dampers, and other controls. It is installed at the location where temperature is to be maintained. The device can be readily employed in control systems of electro-plating tanks, chemical vats and processes, water heaters and other applications.

Because of its rugged construction, the controller designated the Fultrol, may be installed in any position either vertically, horizontally or diagonally. It is designed to control temperatures in wide adjustable ranges from 50 deg to 250 deg F and from 150 deg to 350 deg F. The simple straight through action of the thermal element to pilot valve eliminates need for critical levers and pivots, and makes possible easy disassembly and reassembly, if cleaning or service becomes necessary. *Fulton Sylphon Division, Robertshaw-Fulton Controls Company, Box 400, Knoxville 1, Tenn.*



Cable Reeling Unit

The Series 3 Spring-O-Matic Powereel, a continuous, heavy-duty cable reel with a compact retractable spring, easily adapts itself to all types of mobile electrical equipment. Its automatic operation simplifies and speeds up pay-out and take-up of electrical cables on hoists, cranes, thereby protecting the cables from tangling and unnecessary wear. It is available with either a plain or pivot base. The pivot base allows the reel to swivel over an arc of 330 deg on self-lubricating bearings. Approximate weight of the unit is 25 lb and its operation is based on 30 amp, 600 volt ac, 300 volt dc, 1 to 8 conductor collector rings. *Industrial Electrical Works, 1503 Chicago street, Omaha.*

Hook-On Volt-Ammeter

For measuring current on both insulated and non-insulated conductors without cutting the conductor or interrupting work, the volt-ammeter is equipped with scales that automatically change when the range selector knob is turned. The device is

A/C Cylinders too!

Another road tested application for wear resistant PORUS-KROME*

- **Write today for detailed information on this *NEW* reclamation service.**

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Gaskets—Packings—Molded Rubber Rings for diesel locomotives . . .

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GARLOCK diesel replacement parts —gaskets, packings and molded rubber rings—are packaged in convenient quantities for ease in handling, storing and redistribution to shop men, overhaul shops and terminal points.

All packages are labeled for instant identification—no cross-reference parts list needed.

Garlock diesel gaskets, packings and molded rubber rings are giving completely satisfactory service on leading railroads. Specify Garlock diesel replacement parts and write us for complete parts-and-price list.

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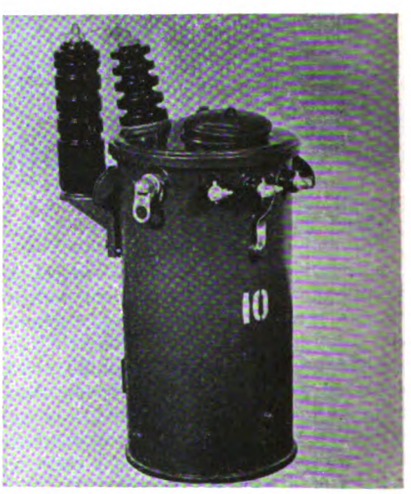
PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

designated AK-4 and includes 150/300/750 volts a-c as its volt ranges.

Current ranges of 10/30/100/300/800 amp a-c provide for the measurement of currents usually encountered in industrial circuits.

In measuring voltages, the screw-in voltage leads are connected into recessed terminals for operator protection. Then, the desired voltage range and scale is selected by turning the selector knob.

Uses for the device include checking circuits, motor overloads, and determining motor starting and running currents. It is said to be ideal for maintenance personnel. The unit operates on a frequency of 60 cycles with a 3-per cent full scale accuracy. *Instrument Division, General Electric Company, 1 River Road, Schenectady 5, N. Y.*



10-kva, 7,200-volt single-bushing unit

Distribution Transformers

A redesigned line of distribution transformers, said to be smaller, have larger ratings, improved sealing and fewer parts, have been made available. They are manufactured in single-phase ratings from 3 to 167 kva, 15,000 volts and below and in 3-phase ratings from 9 to 150 kva, 15,000 volts and below.

Almost 40 external bolts, clamps and lugs have been eliminated in these cover-bushing transformers, by improved tanks and handhole covers. The cover is secured by a single bolt threaded into an internal beam support. This bolt provides improved

15-kva 2,400-volt design

sealing by applying uniform pressure throughout the circumference of the corprene gasket.

New hanger and lifting lugs have straight sides that are welded directly into the tank wall. Its step-core design permits winding the coil closer to the core, giving a shorter mean turn to the coil. Other improvements include new high and low-voltage bushings, lightning arresters and arrester-mounting brackets.

The larger ratings have been designed to meet E.E.I.-N.E.M.A. requirements. Height reductions range from 22.7 per cent for the 25-kva rating to 13 per cent for the 37-½ and 50-kva ratings. *Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.*

Jet Spray Cleaning Unit

Rapid cleaning of motors, compressors, condensers, machinery, engines, and small parts without the necessity of dismantling can be performed with this Steam Kleen jet sprayer.

The unit, Model No. 111, is operated by finger tip control. Changeover from wet to dry steam is instantaneous and is accomplished by merely tilting the device from horizontal to vertical position. Weight of the unit is 16 lb, ready for operation. It has a capacity of ½ gal of water and can

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Lasting, positive protection — the diaphragm that has proved to be the best!

NOW AVAILABLE

The new Morton DL-Non-Flammable fabric for vestibule diaphragms. "Dynel" yarns, woven into a three-ply belting of Morton special 50-50 weave and then impregnated with black neoprene . . . a revolutionary, new material, highly resistant to strong detergents and soaps and inorganic acids, bases and salts. Excellent resistance to mildew fungus, fire and weather!

Leg-Ends Bound
Extra wear, longer life! Web-belting or chrome leather binding.

Exclusive Sectional Construction
Top section has 5 inch pockets into which leg sections fit — absolute weather protection.

Impregnated 3-Ply Belting—Special solution for self-lubrication against friction, acid, fire, water, mildew and rot!

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Separate top and legs effects real savings on replacements!

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Locomotive Cranes
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Materials Handling Equipment

Look at your goggles — Do they have a Ks etched in the lens? If they do, you can go about your work secure in the knowledge that your eyes are getting the finest protection against industrial hazards that modern science can devise.

OTHER KIMBALL SAFETY PRODUCTS

EYE PROTECTION: Spectacle Goggles, Welding Goggles, Composition Goggles, Sideshields.

HAND PROTECTION: GLOVES: Welder's, Asbestos, Steel Stitched. MITTENS: Welder's, Asbestos, Steel Stitched.

BODY PROTECTION: CLOTHING: Wool, Flame-Proofed Cotton. LEGGINS and SPATS: Leather, Asbestos, Flame-Proofed Cotton.

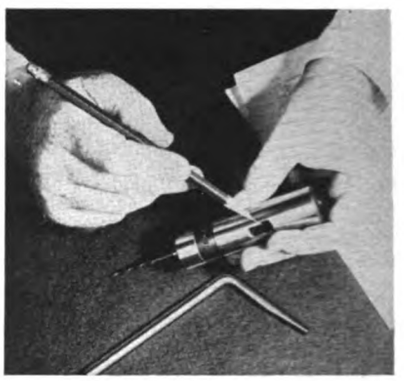
APRONS: Leather, Asbestos, Flame-Proofed Cotton.

Kimball SAFETY PRODUCTS COMPANY

9310 Wade Park Avenue • Cleveland 6, Ohio

be brought up to operating temperature and pressure in 20 min using cold water.

The cleaner is electrically heated, thermostatically controlled, and operates on any 110- and 115-volt circuit. It is fitted with a steam safety valve. *Henry Flow Control Company, Melrose Park, Ill.*

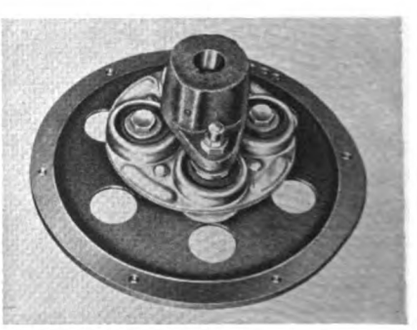


Drift Slot Tool Ejector

A trouble-free ejection method for spindle-type machine tools has been perfected. Specifications for the drift slots and line of standard Keyhole tool ejectors are now being offered designers of machine tools.

The manufacturer claims that this design eliminates damage to machine bearings and spindles often caused by hammering on conventional drifts. Slot design consists of a round portion which serves as a bushing for the key and a rectangular slot to permit use of conventional drifts should a tool or adapter become jammed in the spindle.

The cam-shaped tip of the ejector rotates against the top of the tang, pushing the tool from the spindle in one easy motion. There is no axial stresses or shocking hammer blows to destroy spindle alignment or damage bearings. The ejectors are available in five standard sizes for No 1, 2, 3, 4 and 5 Morse taper spindles. *Scully-Jones and Company, 1901 S. Rockwell street, Chicago 8.*



Flexible Coupling Units

These units attach to flywheels and are adaptable to a variety of industrial machinery drives where a tortionally flexible, shock resistant, weatherproof coupling for fly-

wheel-to-driveshaft connection is required.

The device, **Morflex, has a standard** coupling center member consisting of two steel stampings riveted together and enclosing four neoprene biscuits. A cast-iron adapter plate is bolted to one side of the center member and is attached to the engine flywheel through clutch bolt circle holes. A steel flange is bolted to the other side of the center member.

This design provides a tortionally flexible unit that is claimed to be easy to install and avoids vibration from misalignment and load reversal. The units require no lubrication or other maintenance and are not affected by oil, dirt, grease or water.

The couplings are made in two stock sizes. One size has an adapter plate that fits Ford overhead valve engines and Ford L-head industrial engines. The other fits Chrysler industrial engines. ***Morse Chain** Company, 7601 Central avenue, Detroit 10.*

Special Steel Plate

"T-1" steel is available in commercial plate size. It is said to have a yield strength three times that of ordinary carbon steel; excellent welding qualities without preheating; toughness at sub-zero temperatures; resistance to wear and impact abuse. Considering its high strength, the steel is relatively inexpensive, costing about 2-½ to 3 times more than ordinary carbon steel.

A special formula produces the toughness in the steel. Maximum benefits are derived from minimum quantities of the various alloying elements. Each is added with a distinct purpose in mind. According to the manufacturer, it is an all-purpose steel that was developed primarily to be used in plate form. Initial production will be for general industrial equipment, bridges, earth-moving and construction machinery. *Lukens Steel Company, Coatesville, Pa.*

Metal Equipment Spray Coating

This black coating, Bitumastic K, is made of processed coal tar pitch mineral filler, solvent and granulated cork. It requires no primer. One application gives a covering up to ½ in. in thickness, which it is said, provides protection from corrosion with a moderate degree of insulation.

The cork mastic was developed for use in locations where metal tanks containing heated materials require corrosion protection as well as insulation to prevent major heat losses. It may be used where massive insulation, installed at greater cost is not required. Such protection is suited for oil storage tanks, asphalt storage tanks or any metal tank, the contents of which are kept at temperatures up to 150 deg F. It can also be used to protect corrugated steel sidings and heating and ventilating ducts. *Tar Products Division, Koppers Company, Pittsburgh 19.*

(Equipment continued on page 154)

FRISCO

Congratulations to the Frisco!

•

COMPLETELY RECLAIMED CASTINGS processed in our Modern Pyrometer-Controlled Oven Under A.A.R.-Approved Standards

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We also repair, rebuild, and maintain tank cars and other freight cars.

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A modern shop regularly inspected by A.A.R.

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Grinding Machines to handle crankshafts from the smallest up to those with a stroke of 16" and length of 200". Complete grinding service for locomotive crankshafts. Also camshaft repair service for locomotive engines.

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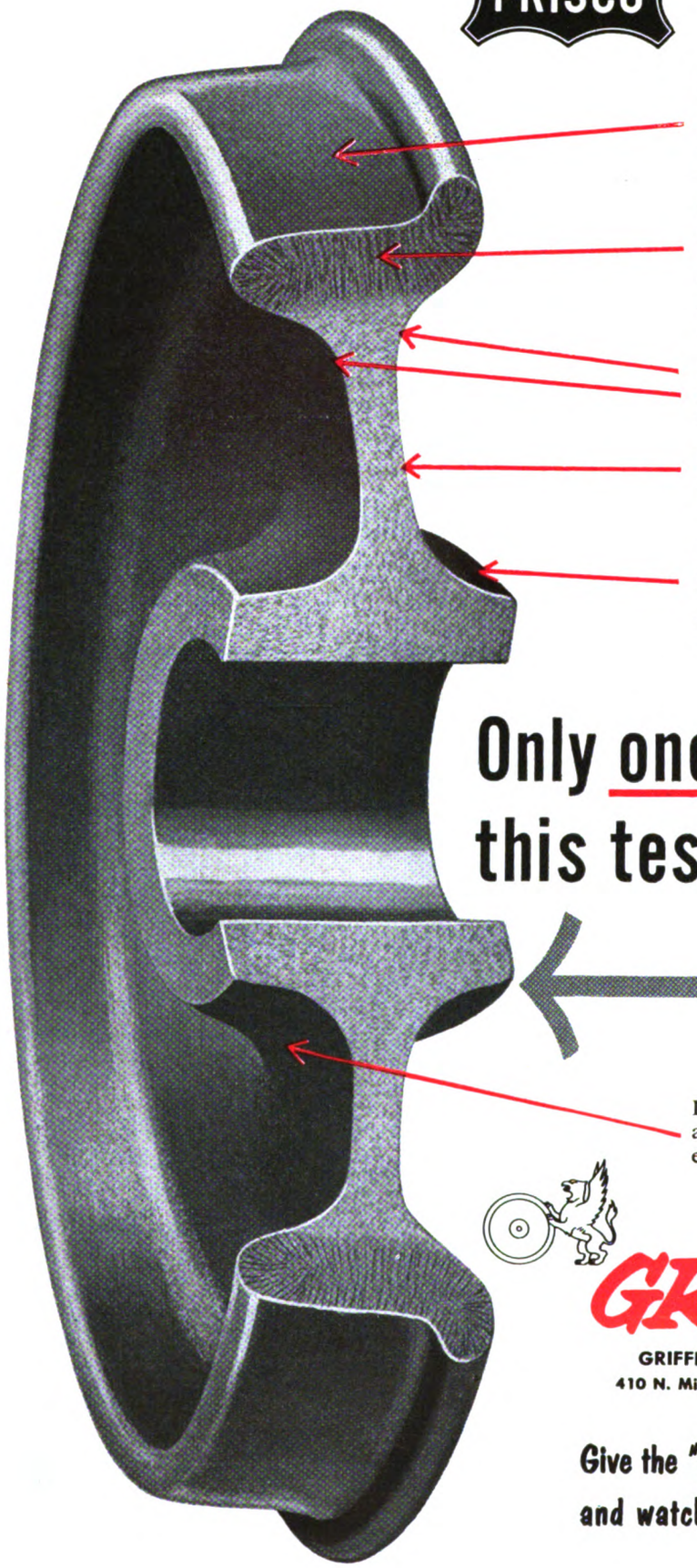

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The Frisco is one of the progressive railroads now testing the Griffin EQS.

Roundness of EQS wheel is practically perfect—as-cast. No machining necessary . . . the toughest and longest-wearing metal is *on the tread, NOT in the scrap bin.*

Pressure pouring in graphite molds results in superior flange and tread wear. Note the directional solidification in flange and tread, shown as-cast: *the grain of the metal in EQS wheels is at right angles to the point of wear.*

Long sweeping fillets under flange and rim of EQS wheels insure greatest possible strength.

The Griffin EQS plate is of *uniform thickness*, dimensionally accurate in any section.

Now made of .75 carbon steel. Exclusive casting process used in producing EQS wheels permits use of recognized steel analysis that will best meet your requirements.

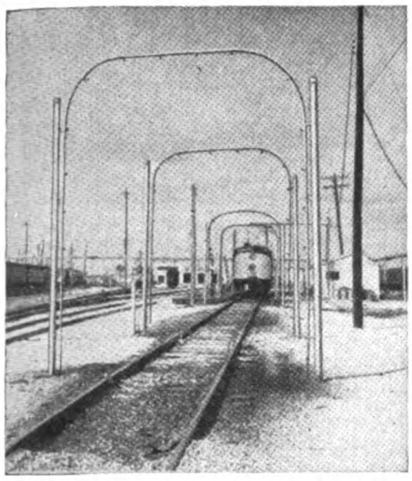
Only one wheel can pass this test with a score of 100

Location of hub and plate is identical in all EQS wheels; dissipation of heat is even, without developing internal stress.

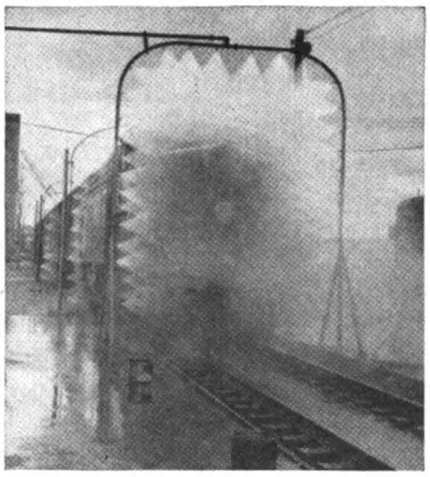
GRIFFIN EQS
ELECTRIC QUALITY STEEL

GRIFFIN WHEEL COMPANY
410 N. Michigan Avenue, Chicago 11

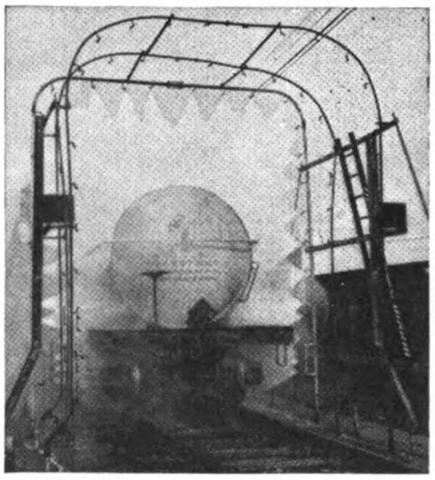
Give the "green" to GRIFFIN... and watch your costs go down!



Pressure washing plant layout.



High-pressure spray stand.



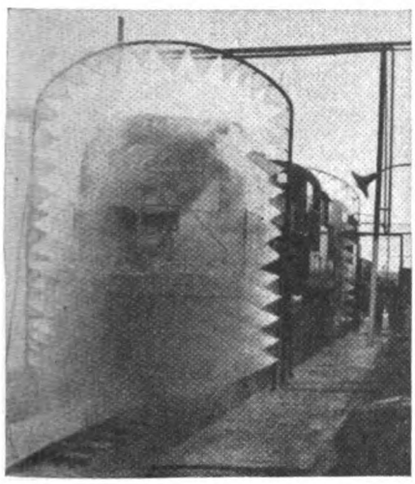
Cleans any contour.

Dearborn...the only system that cleans them all!

The Dearborn High-Pressure Cleaning System washes locomotives (road, switch, steam) and cars—regardless of contour. It automatically cleans tops, ends, sides and trucks; even wheels and bottoms, if desired. Dearborn Pressure Cleaning, when combined with mechanical brush washing, provides the ultimate in terminal passenger, locomotive and car cleaning.

ADVANTAGES: Saves time • Saves labor • Lowers cleaning cost per unit • Speeds up "terminal handling" operations.

Want proof? The coupon will bring complete details.



Washes road, switch and steam locomotives.

Cleans wheels and bottoms, also.

Pressure cleaning plus brush washing... an ideal combination.

"Serving the Frisco"

FRISCO

Dearborn®

PRESSURE CLEANING SYSTEMS

Dearborn Chemical Company
Merchandise Mart Plaza, Dept. RL, Chicago 54, Ill.

Gentlemen: Please furnish complete details on the Dearborn Pressure Cleaning System.

Name.....Title.....

Railroad.....

Address.....

City.....Zone....State.....

Wolfe Brush Company

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Manufacturers for 103 years of high grade brushes for painting and cleaning purposes, especially designed for railroad and industrial users. For many years our brushes have helped successful operation of the "Frisco".

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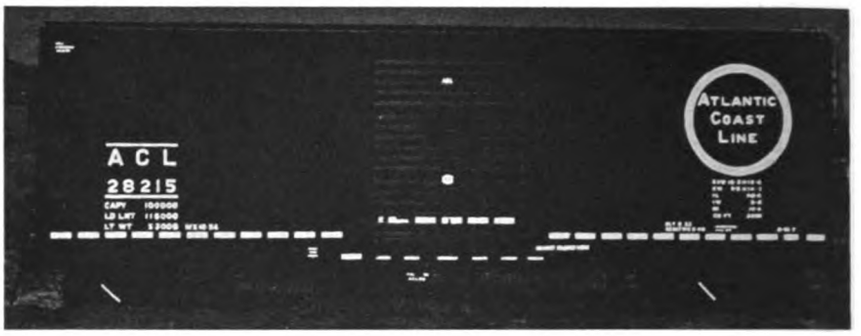
Experienced railroad man to direct school of railroad training. Should have pre-engineering training and know theory and practice in electrical and mechanical subjects, internal combustion engines, diesels, shop operation and maintenance. No traveling necessary. Opportunity to settle down in delightful small town with pleasant surroundings and associates. Pension and group insurance plans. All replies strictly confidential. Please give full details of education, experience, salary desired, etc. Box 501, Railway Locomotives and Cars, 30 Church Street, New York 7, New York.



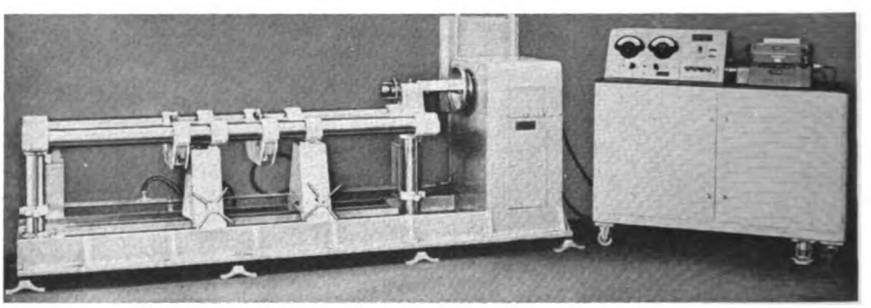
Reflective Lettering

Night accidents at grade crossings are said to occur more frequently as the result of motor vehicles running into the side of a train which blocks the crossing than as the result of the locomotive hitting vehicles on the crossing. There have been cases where a train has been hit by an automobile some fifty cars from the locomotive, resulting in the death of all occupants of the motor vehicle. When a train is made up of flats, gondolas, or pulpwood cars, its visibility to the driver of a highway vehicle may be extremely limited and confusing.

As early as 1948 the Atlantic Coast Line began exploring the field of reflectivity as a protective measure against such hazards of nighttime operation. The Prismo Safety Corporation was authorized to reflectorize several box cars of that road. The Prismo reflective material was applied to the large medallion, the numbers, and the railroad initials of these cars, and a dashed line was run along the bottom of each car. Subsequently, the same treatment was applied to several hundred additional cars, and today all ACL rolling stock, except passenger cars, is reflectorized. Greater safety is said to have resulted on the road and at highway crossings.

The reflectorized cars have offered other advantages in night operation in yards. Cars numbers are more easily identified when the cars are in motion, and the hazards from loose cars running down a track are reduced.

The ACL has also applied Prismo reflective material to station signs, whistle posts, mile posts, and all switch markings. *Prismo Safety Corporation, 301 Penn street, Huntingdon, Pa.*



Remote Control Balancing Machine

This unit furnishes a permanent record of unbalance. All controls and unbalance indicators can be located at any distance from the body of the static-dynamic balancer. The amount and angular location of unbalance in the work piece is indicated on two meters by a highly sensitive Electrodyne electronic indicating system.

Voltage take-offs are provided so that a permanent record of unbalance readings can be made automatically on special electric typewriters. Operation is reduced to push-button simplicity. *Tinius Olsen Testing Machine Company, 4096 Easton Road, Willow Grove, Pa.*

Screw-Lock Inserts

These inserts automatically grip the screw so that it is vibration-proof, and so ends any need for lock washers, locking wires, or lock nuts. They also provide a high strength thread according to the manufacturer and automatically anchors themselves into the parent material without the use of pins, rings, staking or other devices.

This insert can be used in an otherwise frozen design or production piece because it requires no more boss material or wall thickness than a conventional tapped thread. It can be used for products subject to vibration, temperature extremes, periodic inspection disassembly, etc.

The device is dimensionally stable over a wide range of temperatures and resists wear, corrosion, seizing and galling. It is said to provide strong, permanent threads in such soft materials as aluminum, magnesium and plastics. *Heli-Coil Corporation, Danbury, Conn.*

Lewis sealtite car bolts

All products are manufactured in the U.S.A. to A.S.T.M. specifications

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We are proud to be a supplier to the mechanical department of the Frisco line — one of the nation's leading railroads.

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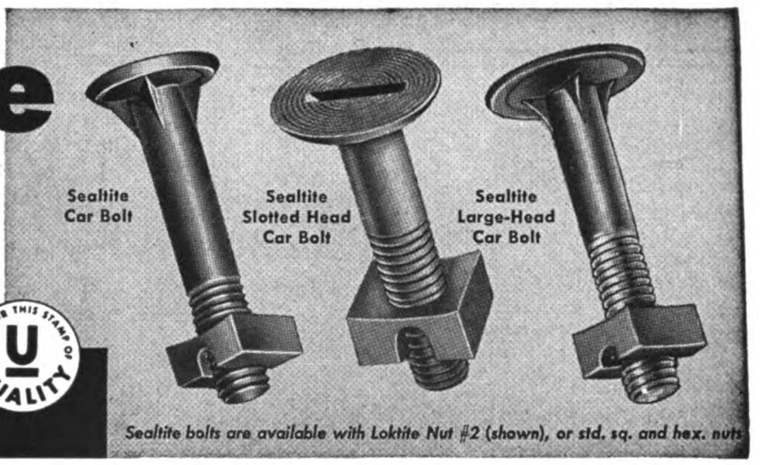


Sealtite bolts are available with Loktite Nut #2 (shown), or std. sq. and hex. nuts

Standard Journal Box

(*Continued from page 93*)

oils to care for heavier loads, higher speeds, longer sustained runs at high speed, and higher rates of acceleration in starting.

In 1948, said Mr. Clark, the N&W initiated a cooperative program to find out if other types of oils could improve the hot-box situation. After some time spent in preliminary research, a dozen blends were developed containing various types of additives which might provide protection to bearings and journals under adverse operating conditions. After complete laboratory tests, several blends were field tested in comparison with other oils. Viscosity ranged from 200 to 650 sec at 100 deg F. Some were straight mineral oils and some had additives. The tests were run on several fully loaded 70-ton cars operating in a special train. The bearings were fitted with temperature recorders. The N&W thoroughly analyzed the results. Conclusions were as follows: (1) under normal conditions, lower viscosity oils resulted in lower temperatures; (2) higher viscosity oils gave better performance on rough journals; (3) boxes can operate on a minimum of five pints of oil; (4) seating or breaking in of bearing does not cause hot boxes; (5) premium oil with additives gave better performance than straight mineral oils, especially when cars were going slowly around curves. Temperatures with straight mineral oils increased rapidly, while additive oil kept temperature down.

The oil which showed up best was an additive type which meets all the physical tests of the present AAR Specification EM 906-50. The antiwear additive prevents excessive temperature rise in heavily loaded journals especially at slow speeds and around curves. The polar additive provides an adhesive lubricating film when bearings operate under borderline conditions, especially in summer. The -35-deg-F pour characteristics assure adequate lubrication at low winter temperatures. "It has about the best characteristics of any all-year oil we have developed to date," said Mr. Clark. It is being used by 14 railroads with improvements in hot-box records ranging from 45 to 95 per cent in miles per hot box set out.

"We do not feel," said Mr. Clark, "that any journal-box oil will be a panacea for all the hot-box troubles on a railroad. A good oil is only one of the factors.

"Although we feel that a premium car oil represents a substantial improvement . . . we do feel that a still better product could be made if economic factors were not too stringent.

"Regardless of what medium is used to get oil to a bearing, it is our conviction that oil quality in the long run will pay for itself."

Education that Fosters Teamwork

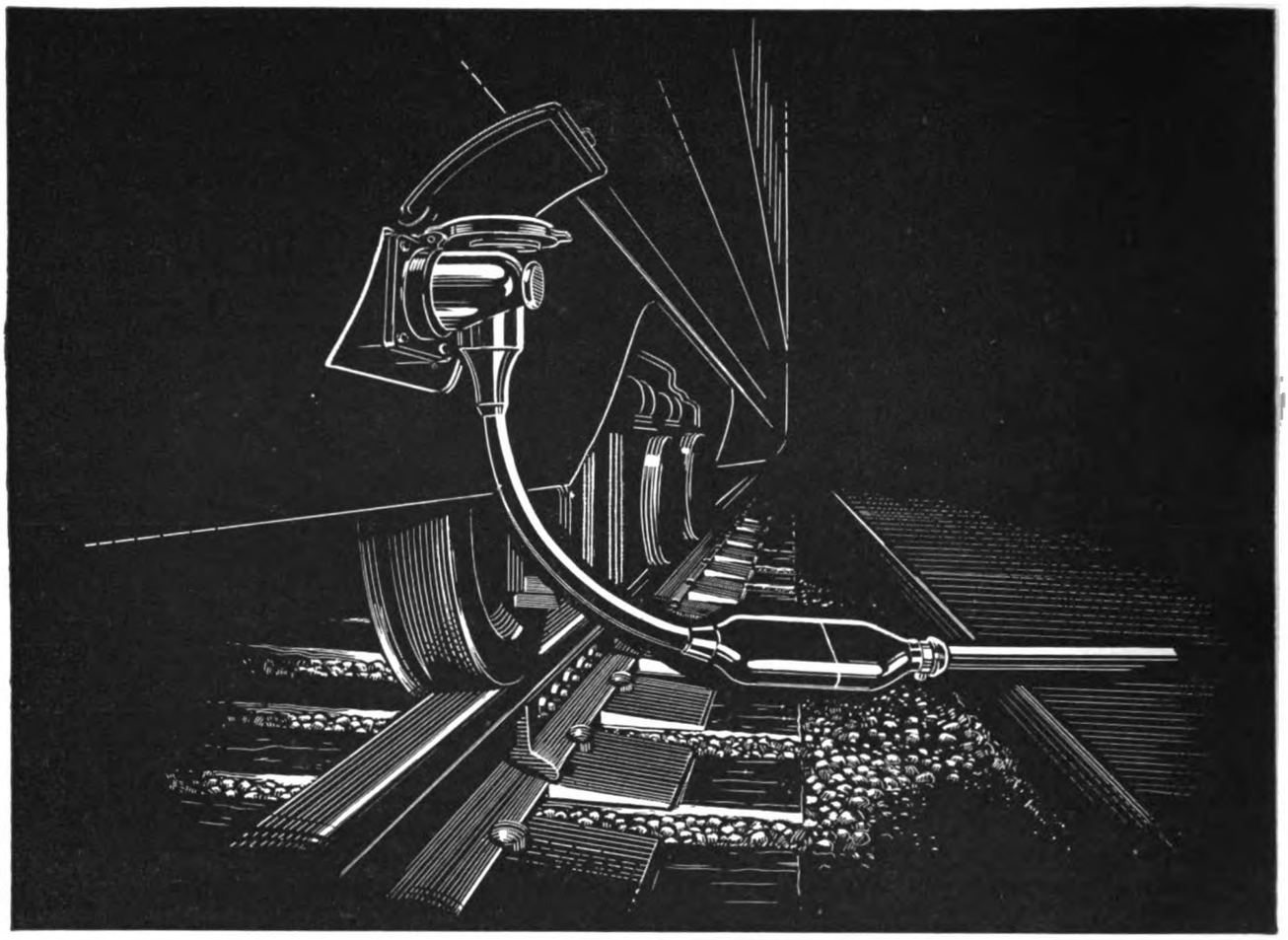
What caused the B&O freight-car journal box performance to be three times as good in 1954 as in 1942?

Searching for the answer, Mr. Seniff concluded that improvements in materials did not provide the answer in the face of a steady rate of dieselization. "We believe that more can be done to prevent hot boxes by education than by any other way," said Mr. Seniff. "To us, it means that the education starts at the top and works downward and literally through all the individuals who are in any way connected with the operation and mainteance of freight cars." Its essence is in the realm of human relationships and psychology. It maintains free channels for the flow of information from the bottom to the top, as well as from the top down. The supervisor of lubrication keeps these two-way channels open.

Everyone must accept the fact that the solid bearing will run without overheating (most of them do) if conditions are right, he said. The men and supervisors must know the "why" as well as the "how" of the work they do. Everyone must be sold that the standard method is the best. Education involves learning what is a well balanced and efficient force and how much time is required to do the job. Everyone must be convinced that the best materials are being furnished and that no source of information has been left unexplored.

Hot boxes on the morining report must receive immediate and uniform action, he said. The performance of servicing points must be compared and those with poor records must be helped to improve. Pride of accomplishment must be fostered at all levels. There is no substitute for good morale and teamwork.

Mr. Seniff expects the improvements to continue.



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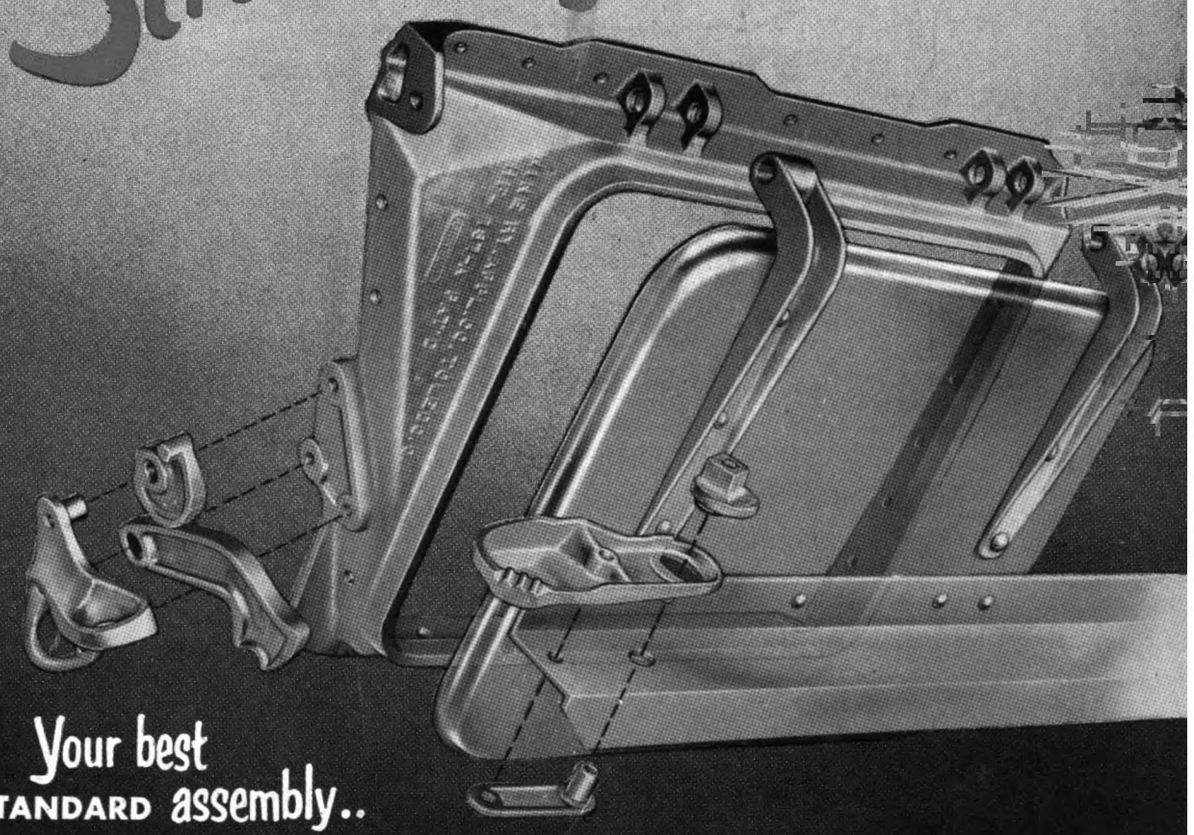

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

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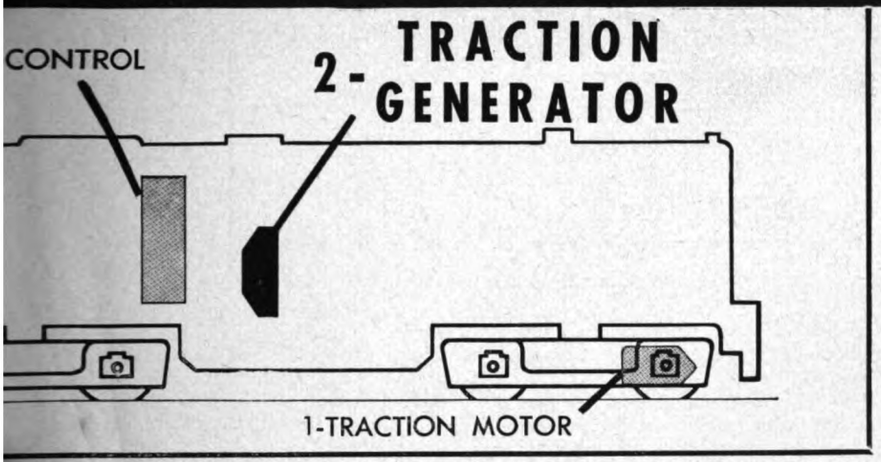

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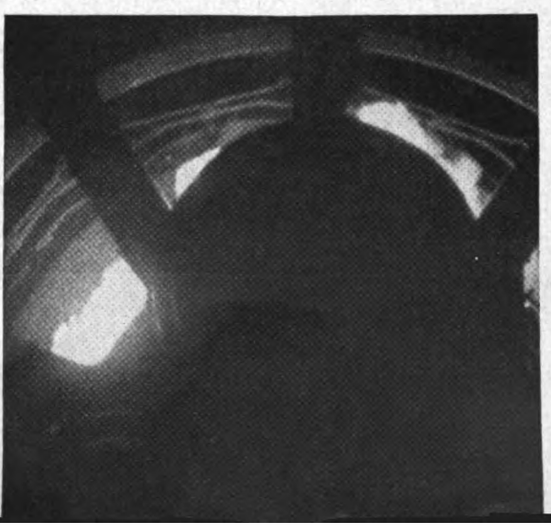
GENERAL ELECTRIC

These high-speed photos from G.E.'s revolutionary film, "The ABC of Flashovers," show accurately what happens when a generator is flashed over.

1. The flash begins its path over the commutator of a standard production generator.

2. Chain-like reaction next occurs as conductive gases erupt and blaze across the entire commutator.



3. Climax is reached in violent explosion. Generator took over 400 flashovers in test.

NEWS

F. N. Houser, Jr.

F. N. Houser Joins Editorial Staff

Frederick N. Houser, Jr., formerly with the Bessemer & Lake Erie at Greenville, Pa., has joined the staff of *Railway Locomotives and Cars*, as associate editor, with headquarters at New York.

Mr. Houser was born on January 1, 1925, in Stoneboro, Pa. He is a graduate of Carnegie Institute of Technology (B.S. in M.E. 1947). He served with the U.S. Army during World War II, and from 1948 until 1954 had been employed on the B&LE as draftsmen, special engineer, and enginehouse foreman. Previous to joining the staff of *Railway Locomotives and Cars*, he was with the Babcock & Wilcox Co. in Beaver Falls, Pa.

Mr. Houser, who also taught engineering drawing at Thiel College, Greenville, for 4½ years, is a licensed professional engineer in the State of Pennsylvania.

Proposed Designs of Passenger Equipment

At least four railroads soon will place orders for new passenger train equipment "startlingly different" from conventional designs, according to a joint announcement by the presidents of the Baltimore & Ohio, the Chesapeake & Ohio, the New Haven, the New York Central, the Pennsylvania and the Santa Fe.

After six months' study of all present and proposed designs for modern passenger equipment, during which time representatives of the railroads toured Europe and worked with the major car builders in the United States, it was decided that three distinct types of new train designs should be constructed and operated, the announcement said. These are in addition to a modified type of "Talgo" train being built by ACF Industries for the Rock Island.

The Santa Fe soon will decide upon a new design for equipment to be used first in its "El Capitan" between Los Angeles and Chicago.

The NYC has agreed to purchase a complete integrated train similar to the design known as "Train X." The road also is planning experimentation with moderate distance runs, such as New York-Buffalo and Chicago-Detroit, both for daylite and evening trips.

The New Haven will purchase a third type of train, being designed in cooperation

(*Continued on page 10*)

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE MARCH ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Canadian National	23	1,200	Switching	General Motors Diesel, Ltd.
	10	1,200	Switching	Canadian Locomotive
	5	1,200	Switching	Montreal Locomotive
	6A[1]	1,600	Passenger	Montreal Locomotive
	6B[1]	1 600	Passenger	Montreal Locomotive
Chicago, Burlington & Quincy	30[2]	1,750	Yard	Electro-Motive
	10[2]	2,400	Passenger	Electro-Motive
	10[2]	1,200	Switching	Electro-Motive
Denver & Rio Grande Western	2A[3]	1,750	.....	Electro-Motive
	4B[3]	1,750	.....	Electro-Motive
	12[3]	1,750	Road switching	Electro-Motive
Montana Western	1	550	.....	Baldwin-Lima-Hamilton

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	100[4]	Refrigerator	Company shops
Chicago & North Western	226[5]	50-ton box	Pullman-Standard
Chicago, Burlington & Quincy	350[6]	50-ton box	Company shops
	400[6]	70-ton goldola	Company shops
	10[6]	125-ton flat	Company shops
	190[6]	50-ton flat	Company shops
	50[6]	70-ton flat	Company shops
Chicago Great Western	10[7]	70-ton covered hopper	Pullman-Standard
	10[7]	Caboose	International Ry. Car
Gulf, Mobile & Ohio	100[8]	50-ton pulpwood	Company shops
Illinois Central	35[9]	50-ton box	Company shops
Western Maryland	100[10]	70-ton covered hopper	Greenville Steel Car

FREIGHT-CAR LEASES

New York, New Haven & Hartford	200[11]	Flat	

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Northern Pacific	2[12]	.....	Budd Co.

[1] For delivery this month.
[2] For delivery during second half of this year.
[3] The A and B units, type F-9: the passenger units, Type GP-9. Scheduled for July and August delivery. Total estimated cost of 18 units, approximately $3,200,000.
[4] In addition to 50 reported in the March issue, page 6. These 50-ft mechanically refrigerated cars will be insulated for transporting frozen foods at temperatures of zero or lower.
[5] For delivery this month.
[6] For delivery during second half of 1955.
[7] Delivery of hopper cars expected last month: delivery of caboose cars to begin this month and be completed in June. Estimated cost of hopper cars, $92,000. Estimated cost of caboose cars $159,000.
[8] In addition to 100 reported in the December issue, page 14.
[9] Estimated unit cost, $5,500.
[10] To be equipped with roller-bearing trucks. Construction scheduled to begin in June.
[11] Under lease from Piggy-Back, Inc., for "piggyback" operation. To be similar to two units built in shops of the New Haven and now in experimental operation. Builder of 200 units not yet determined. To cost approximately $8,000 each.
[12] One 70-passenger (RDC-2); one 48-passenger (RDC-3).

NOTES:

New Haven.—The biggest single improvement program ever to be undertaken by this road will represent an investment of $64,000,000 during the next five years, according to Patrick B. McGinnis, president. The initial phase will begin as quickly as orders can be placed and contracts signed. Among the projects in the program are heavy repairs to be made to 517 gondola cars, which, when in good shape again, will be sold to the International Railway Car Company, of Buffalo, and then leased back for the New Haven's use for $44 a month. After five years the lease can be renewed for another five years at $1.80 per month, upon completion of which the cars are expected to be no longer useful. The rental income these cars will bring in to the NH while they are being used on other lines is expected to exceed the rent the NH must pay to International.

General Motors.—"The first of the new style passenger coach designs expected to be on the rails is being developed by General Motors," according to a recent issue of the Pennsylvania employees' magazine, The Pennsy. "It will come to the PRR for inspection and test runs." The Pennsy says. General Motors sources, however, have declined to confirm this report. The "coach designs" which The Pennsy says General Motors is developing should not, apparently, be confused with the "completely new type of passenger train" which the PRR is understood to be working out with another builder. [See "Proposed Designs of Passenger Equipment" beginning on this page.—Editor.]

FR-16

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The FR-16 Rubber Draft Gear has been scientifically engineered to meet the most severe service on American railroads. From A.A.R. laboratory data we are pleased to announce a capacity of 39,400 foot pounds for this new gear at 2¾ inches travel. At one-half travel, 25 per cent of the work is accomplished, thereby providing full-time protection for lading, car and attachments for present and future requirements. These results are realized with a maximum sill pressure of 475,000 pounds. Ample initial compression with instantaneous response to car impacts eliminates slack or time lapse, and provides continuing restraint of the coupler, restricting its movement through the zone of high pressures and destruction. The only rubber gear fully enclosed. Requires no special tools or effort to install.

MAXIMUM PROTECTION AT EVERY FRACTION OF TRAVEL

W. H. MINER, INC. CHICAGO

NEWS

(*Continued from page 6*)

with Grumman Aircraft Company engineers. The New Haven will concentrate on its main-line New York-Boston service.

The Pennsylvania's Board of Directors has "authorized construction" of a train, incorporating a "wholly new coach design, combining 'close-to-the-rail' glider riding qualities with full-strength tubular construction."

The basic design of the train, according to President J. M. Symes will have "the lowest center of gravity of any train yet engineered."

Consisting of seven coaches and a power car for air conditioning, heating and lighting, the new PRR train will accommodate nearly 600 passengers. It will be used at first in "moderate distance" service between major cities on schedules "materially faster than would be comfortable on conventional trains," Mr. Symes declared. It will cost approximately $1,000,000. Initially, existing diesel-electric or electric locomotives will be used, depending on the service to which the train is assigned.

"With probable quantity production of this type of train in the future, resultant lower construction costs and the lower operating and maintenance costs which are assured, I believe we can look toward a substantial reduction in the cost of providing railroad passenger service," Mr. Symes said.

"The new cars will differ radically from conventional railroad equipment, in that the floor, sidewalls and roof will constitute a car-length tube of great strength. This eliminates the need for a heavy steel 'center sill', and provides a lower, less weighty body structure."

He said another advantage of the design is that, with the elimination of the center sill, the car floor can be depressed in the center section between the wheels, opening the way to an "interesting two-level floor arrangement, providing a center of gravity almost a third lower than in conventional cars."

"The center of gravity of the cars determines the speed at which trains may round curves without discomfort to passengers," Mr. Symes explained. "Low centers of gravity are inherent in diesel and electric locomotives, so that by reducing that factor in the cars we can materially quicken train speeds on curves with full safety and comfort for the passengers. Important reductions in running time will result."

The new cars will be 21 in. lower overall than existing coaches, will weigh only 60% as much, and will ride on a four-wheel truck under each end. The reduction in weight permits use of the smaller wheels, contributing to less car height. Each car will be 85 ft long. and will accommodate 84 passengers in reclining seats. Lavatory facilities will be provided in each car, as well as space for hand baggage.

The two-level floor design with seats on the higher level for 12 passengers at each end and for 60 passengers on the lower level, will provide entrance vestibules designed for boarding and alighting at either track-level or regular station platforms.

"This new train was developed by the Mechanical Research Committee set up by six railroads, including the Pennsylvania, to plan passenger trains of entirely new types completely adapted to modern transport needs," Mr. Symes said. "The tubular design and the other developments which characterize this approach to rail travel are among the results of the committee's six month's study of all present and proposed concepts for modern passenger equipment in this country and abroad."

He added that cars may be readily attached to or taken from the train, giving it desirable flexibility in meeting varying traffic demands and making for more efficient operation.

Mr. Symes said that orders for the new train would be placed as soon as detailed specifications are completed.

The railroads cooperating in developing the new train designs will share all information regarding engineering and economic results, as well as details of passenger acceptance, and thereby pool experience to guide any future development work.

In addition to these train designs, General Motors Corporation is developing an experimental train with a special high-speed diesel locomotive with the intention of having it available to railroads for trial use, starting in late 1955, the joint announcement said.

Howard E. Simpson, president of the Baltimore & Ohio, and Walter J. Tuohy, president of the Chesapeake & Ohio, the two other cooperating railroads in a group of six, temporarily postponed any announcement of their plans.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of December 1954	Month of December 1953	12 months ended with December 1954	12 months ended with December 1953
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,212	8,657	73,193	142,863
3-06	Total, Diesel-electric	34,315	31,470	391,432	375,352
3-07	Total, electric	655	611	7,791	8,589
3-04	Total, locomotive-miles	40,408	40,830	474,313	527,650
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,524	1,439	18,147	19,756
4-06	Empty, total	942	935	10,634	11,055
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	11,199	15,690	148,871	259,933
6-02	Total in oil-burning steam locomotive trains	1,369	3,009	26,179	67,885
6-03	Total in Diesel-electric locomotive trains	93,572	83,514	1,081,817	1,044,854
6-04	Total in electric locomotive trains	1,993	1,699	23,912	24,400
6-06	Total in all trains	108,870	104,207	1,287,177	1,399,875
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.03
10-02	Loaded freight car-miles	40.40	37.90	41.00	40.50
10-03	Empty freight car-miles	25.00	24.60	24.00	22.70
10-04	Total freight car-miles (excluding caboose)	65.40	62.50	65.00	63.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,885	2,742	2,906	2,873
10-06	Net ton-miles	1,261	1,188	1,287	1,301
12	Net ton-miles per loaded car-mile (M-211)	31.20	31.40	31.40	32.10
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	61.80	60.60	63.10	64.10
14	Averages per train hour (M-211):				
14-01	Train miles	18.90	18.70	18.70	18.20
14-02	Gross ton-miles (excluding locomotive and tender)	54,006	50,806	53,897	51,750
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	43.60	41.20	42.80	45.40
14-02	All	40.90	39.30	40.30	43.20
15	Average net ton-miles per freight car-day (M-240)	789	747	799	890
17	Per cent of home cars of total freight cars on the line (M-240)	53.60	55.10	53.10	47.10

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	2,049	3,428	26,593	48,713
3-06	Diesel-electric	21,829	21,721	259,918	243,606
3-07	Electric	1,477	1,574	16,659	18,281
3-04	Total	25,358	26,723	294,175	310,601
4	Passenger-train car-miles (000)				
4-08	Total in all locomotive-propelled trains	266,895	276,750	2,964,368	3,141,066
4-09	Total in coal-burning steam locomotive trains	10,946	18,625	131,219	269,337
4-10	Total in oil-burning steam locomotive trains	7,769	12,460	99,684	170,119
4-11	Total in Diesel-electric locomotive trains	231,337	228,031	2,548,482	2,498,397
2	Total car-miles per train-miles	10.18	10.04	9.71	9.78

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	262	416	3,626	6,877
1-02	Steam, oil-burning	51	63	649	1,201
1-03	Diesel-electric[1]	3,477	3,402	39,617	41,291
1-06	Total	3,799	3,898	44,025	49,601
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	12	18	141	236
2-02	Steam, oil-burning	5	4	62	74
2-03	Diesel-electric[1]	275	281	3,062	3,095
2-06	Total	320	335	3,576	3,786
3	Hours per yard locomotive-day:				
3-01	Steam	4.80	5.40	4.80	6.70
3-02	Diesel-electric	15.40	15.40	15.00	16.10
3-05	Serviceable	15.00	14.30	14.50	14.90
3-06	All locomotives (serviceable, unserviceable and stored)	13.00	12.50	12.40	13.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.73	1.87	1.69	1.74
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.74	.75	.75	.75

[1]Excludes B and trailing A units.

Freight Cars Owned Down 41,296 in 1954

Despite a loss of 41,296 freight cars owned by Class I roads last year, the daily number of surplus serviceable cars ranged from 28,000 to 140,000 according to A. H. Gass, chairman, Car Service Division, Association of American Railroads.

In a recent report on "The National Transportation Situation," Mr. Gass states that Class I roads and their car-line affiliates placed 30,562 new cars in service and retired 71,858 in 1954. The total of cars owned as of January 1, was 1,816,752 against 1,858,048 on January 1,1954. With 119,722 cars awaiting repairs at the first of the year, Mr. Gass reported, there was a total of 1,697,030 serviceable cars owned January 1 against 1,766,629 a year ago.

He also reported "the smallest average shortage" for the past 12 years with shortages ranging from a minimum of 15 to a high of 3,664, mostly among high grade wide-door or 50-foot box cars.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
December, 1951	2,752,316	2,130	5,398	7,528	365,611
December, 1952	2,859,928	1,742	3,632	5,374	534,040
1953					
January	2,828,906	2,219	4,123	6,342	446,059
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,946
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,598	9,712	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070

Mills Advises Attention to Brake Tests

Non-observance of the rule requiring air-brake tests at points where motive power or crews are changed "is at present causing considerable concern, and in many locations proper adjustment of piston travel is being sadly neglected," S. N. Mills, assistant director of the ICC's Bureau of Safety and Service, said at the March 11 meeting of the Eastern Car Foreman's Association in New York. "These are matters which should be given careful and continuing attention by all railroads," he continued.

Mr. Mills also discussed legal aspects of railroad proposals to establsh joint car-repair facilities at interchange points. At such facilities, cars having defective safety appliances, which were discovered when they were offered in interchange, could be repaired with a minimum delay and back-haul movement.

The proposals grew out of a resolution wherein the National Association of Shippers Advisory Boards suggested that the Association of American Railroads make a study designed to effect arrangements which would permit the forwarding of a rejected car to the nearest repair shop of the receiving or delivering carrier. The plan for joint repair facilities at interchange points was suggested by the general committee of AAR's Operating-Transportation Division.

As Mr. Mills pointed out, the law's general requirement is that movement of a defective car to a place of repair can be made only by the carrier upon whose line the car became defective. If, however, a defective car is offered in interchange in association with other cars that are not defective, a receiving carrier may, in refusing the defective car, perform such incidental switching as is necessary to separate it from other cars.

And the incidental switching may be to a joint repair track "if such disposition would require no more handling than would otherwise be required in consummating refusal," Mr. Mills said. On such joint track, the car would be at the nearest repair facility of the responsible carrier, and "it is not material by whom the repairs are made," he added.

In a recent circular dealing with the proposal, AAR Vice-President R. G. May said the arrangement "would permit the receiving line to make repairs and accept cars in interchange that are now being delayed on account of back-haul movement to a repair point on the line of the delivering carrier." Mr. May added that any such arrangement should be submitted to Mr. Mills for clearance.

In another part of his New York address, the assistant director of the ICC bureau referred to pending revision of the commission's order prescribing safety appliance standards. He said that "few, if any, radical changes" appear in the proposed new order, which does, however, have 26 classifications of cars and locomotives as compared with the present order's 18.

PERSONAL MENTION

Atchison, Topeka & Santa Fe

J. ROBERT PHELPS, general machine shop foreman at San Bernardino, Cal., has retired.

Atlantic Coast Line

D. B. LACY, master mechanic at Jacksonville, Fla., appointed assistant superintendent motive power, Southern division with headquarters at Waycross, Ga.

G. R. GIBBS, diesel foreman at Jacksonville, Fla., appointed master mechanic.

Baltimore & Ohio

EDWARD L. BROWN, master mechanic in charge of Staten Island Rapid Transit repair shops, appointed superintendent of B&O floating equipment, with headquarters in New York.

Staten Island Rapid Transit Railway Co.

R. W. BALDINGER appointed master mechanic, with headquarters at St. George, S.I., N.Y.

Canadian National

WILLIAM P. MOFFAT, transportation engineer, appointed chief of research at Montreal.

PHILIP L. MATHEWSON, chief of research at Montreal, appointed assistant chief of motive power and car equipment, system.

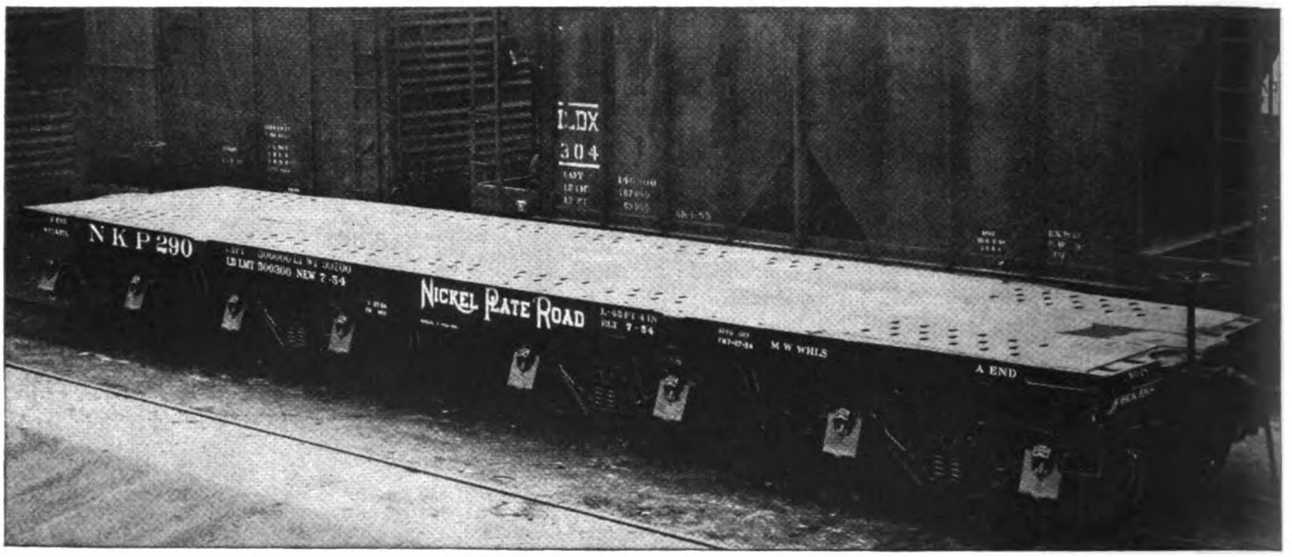
JAMES A. McDONALD appointed assistant to vice-president of research and development at Montreal.

K. W. THOMPSON, mechanical engineer at Montreal, appointed general foreman of Stratford, Ont., motive-power shops.

Central of Georgia

WILLIAM H. MIMS, electrical engineer, appointed superintendent of motive power and equipment at Savannah, Ga. *Born*: May 6, 1909, at Beatrice, Ala. *Education*: Alabama Polytechnic Institute (B.S. in E.E. 1932). *Career*: Began in 1942 as draftsman, mechanical department, Georgia Railroad. Following year draftsman, chief engineer's

(*Continued on page 81*)



Four wheel truck side frame castings for this flat car were produced by The Buckeye Steel Castings Company, Columbus, Ohio. Span Bolster Castings and the Truck Bolsters (transverse bolsters) were made of a cast nickel-manganese steel to meet A.A.R. Specification M-201, Grade C, calling for minimum mechanical properties as follows:

Tensile Strength, p.s.i.	90,000
Yield Strength, p.s.i.	60,000
Elongation in 2"%	22
Reduction of Area %	45

Nickel Plate goes Nickel

Adds strength and cuts weight with nickel steel underframe and truck castings

Capacity of the flat car illustrated was increased from 493,000 lbs. to 500,000 lbs. by casting the underframe in a 2½% nickel steel . . .

. . . permitting 7,000 lbs. more in pay load than would have been available with carbon steel!

The addition of nickel increases the strength of the cast steel thus saving weight.

The one piece cast steel underframe for this car was produced by General Steel Castings Corp., Granite City, Ill., to meet the following minimum properties:

Tensile Strength, p.s.i.	75,000
Yield Strength, p.s.i.	48,000
Elongation in 2"%	25
Reduction of Area %	50

The use of nickel in these castings results in exceptional toughness at both normal and subzero temperatures . . . together with high fatigue strength and excellent ductility. If damaged, this nickel steel is easily repaired by welding.

You will find many suggestions on ways to increase the life and earning capacities of your cars in our comprehensive booklet "Nickel Alloys in Railroad Equipment." Write for your copy and any other information you need.

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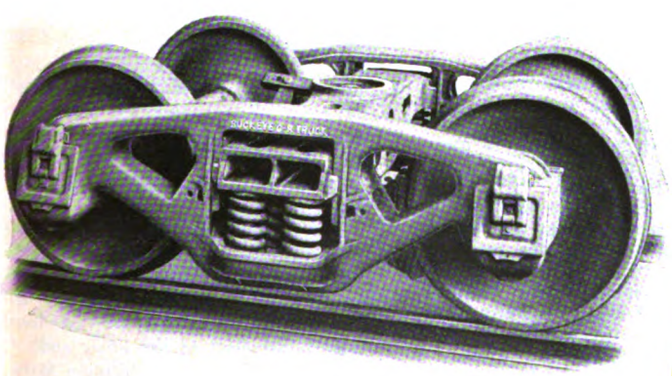

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Refer Adv. No. 11872

* First featured on Buckeye's famed C-R (Cushion Ride) truck now standard process on all Buckeye trucks with integral journal boxes

The Buckeye Steel Castings Co.

- COLUMBUS, O.
- NEW YORK, N.Y.
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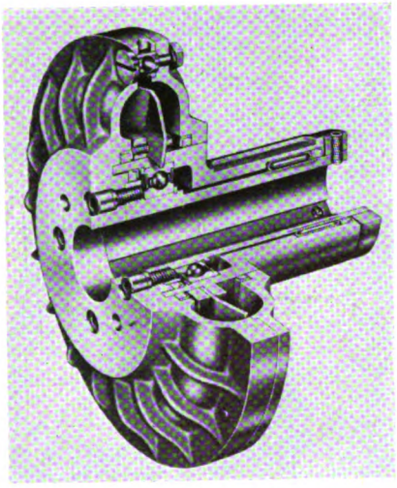
- ST. PAUL, MINN.



Sectional view of Flexidyne Drive

A *Dry* Fluid Drive

Flexidyne, a new development in industrial power transmission described as a *dry* fluid drive, is based upon a completely new principle. It handles difficult starting and reversing problems, and gives a new kind of protection against shock and overloads. Its major advantages are based on the fact that at normal operating speeds it does not slip. At the same time, in the case of an overload, it is slippage which gives protection.

Originated in Europe, the new drive has been redesigned by Dodge to American standards and will be available from stock through regular Dodge distributors. Actual delivery dates have not yet been announced.

It is claimed to have wide application for industrial drives involving heavy inertia and shock loads on such equipment as compressors, centrifuges, conveyors, and machines used in metal-working plants.

The Flexidyne drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the "flow charge," which acts very much like a fluid. It is the flow charge which transmits power from the housing to the rotor. This flow charge is easy to seal in, has a high density and can stand relatively high temperatures.

The amount of the flow charge determines the torque capacity. Because it is easy to vary the amount of this charge, the Flexidyne will give the exact starting torque needed for anything from the smoothest to the fastest start.

Accurate overload protection is assured as the Flexidyne can be set to slip at anywhere from as low as a gentle 20 per cent over full load torque. During starting and overload periods the current draw is at a minimum, because with the standard Flexidyne setting the motor is never pulled down to less than 90 per cent of synchronous speed.

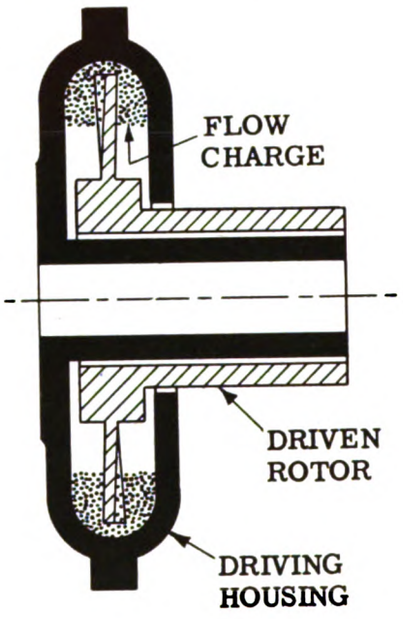
All this is due to Flexidyne's new principle, which produces constant torque for a given input speed, regardless of the percentage of slip between the rotor and the housing (which only occurs during starting or overload).

It is said that, with Flexidyne drive, uniform performance is assured regardless of changes in the surrounding temperature; the Flexidyne has long life and requires practically negligible manitenance.

Aside from Flexidyne's low first cost, low maintenance and top efficiency, it permits the use of smaller, cheaper motors and controls, with greatly reduced current demands and improved power. Its smoother starts and gentler overload protection avoid breakage and reduce maintenance on drives, gears, bearings, and driven machinery.

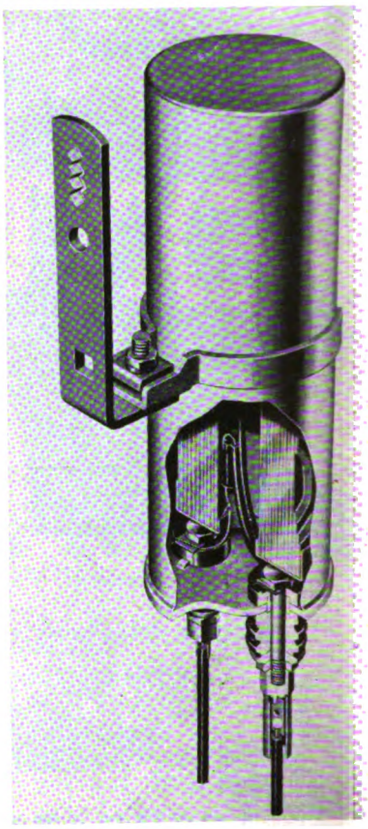
Each size has a standard horsepower rating and yet it is only a matter of minutes to vary the flow charge to give the exact torque required to suit a particular job.

Two lines will be available: (1) Flexidyne drives for convenient mounting directly on motor shafts and adapted for Dodge Taper-Lock sheaves, and (2) Flexidyne couplings, with Taper-Lock bushings for straight line drives. First to be offered from stock will be four sizes of Flexidyne drives, rated at 3 to 30 hp at 1,800 rpm. Other sizes will follow. *Dodge Manufacturing Company, Mishawaka, Ind.*



HOW THE FLEXIDYNE DRIVE WORKS

1. **The motor is connected to the housing, and starts it turning at no load.**
2. **The flow charge is thrown to the circumference of the housing, is compressed by centrifugal force, and revolves with the housing.**
3. **The rotor, connected to the load, is started and accelerated by the friction and wedging action of the revolving flow charge.**
4. **Rotor and housing reach identical speeds—the Flexidyne operates with *Zero Slippage* between motor and load at normal running speeds.**
5. **Before overloads cause damage, the Flexidyne rotor slips relative to the housing, overcoming the friction and wedging action of the flow charge. A thermal switch (optional) automatically cuts the electrical circuit if an overload persists.**
6. **The amount of the flow charge determines the torque transmitted.**

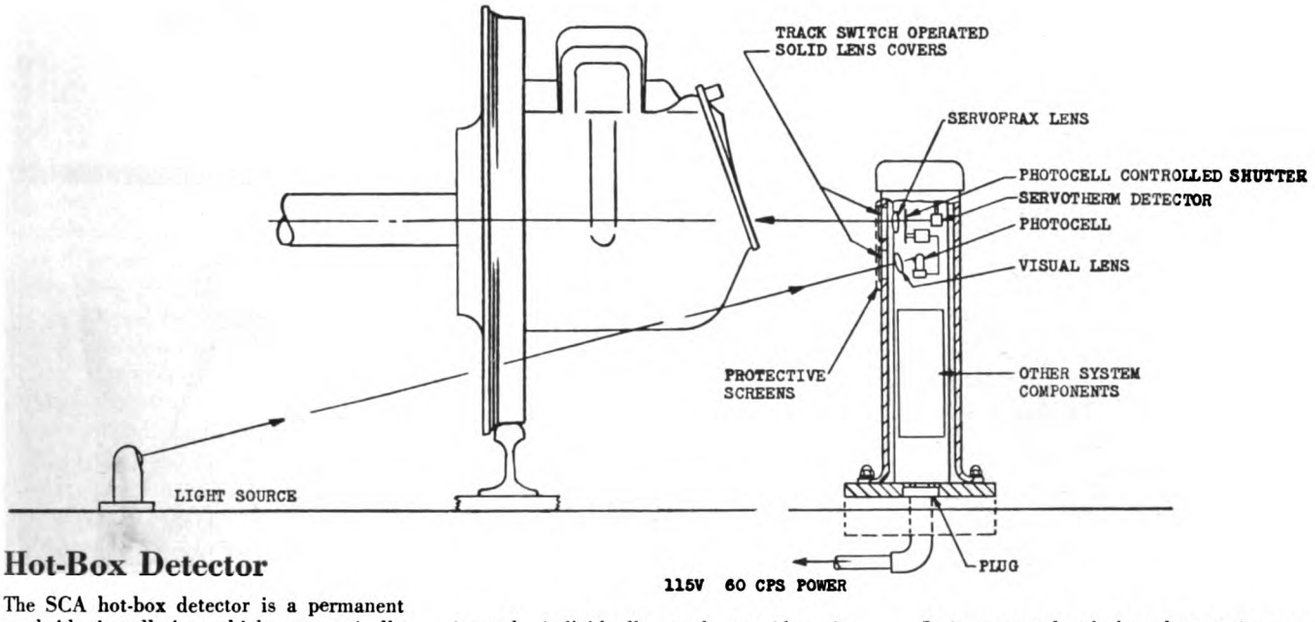


Low-Voltage Power Capacitor

This Type FPS 5-kvar capacity, single phase, 240-volt power capacitor has been designed for secondary distribution circuits. Designated Type FPS. It provides for mounting with terminals either up or down and is supplied with a galvanized steel bracket for direct pole mounting. An adapter converts the pole bracket into a standard EEI-NEMA cross-arm bracket.

Terminal-mounted fuses coordinated with the unit's rating are now available. One end of the fuse has a tapped connector nut that screws directly on the capacitor terminal stud. An insulated lead is attached to the other end.

Aluminum case construction gives permanent protection against atmospheric corrosion. Two insulated leads are supplied to permit easy connection to feeders. Approximate weight of the device is 25 lb; and length, 26-7/16 in. *Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.*



Hot-Box Detector

The SCA hot-box detector is a permanent trackside installation which automatically inspects journal boxes of passing trains by using infrared detection techniques. The device detects temperatures considered dangerous by reacting to infrared radiation.

In operation, a shutter, actuated by the passing train wheels, allows the balometer eye of the device to inspect each journal individually and consider its temperature. A reaction to the dangerous temperatures of 250 deg F and over takes form as an output pulse, which can be used to notify the train or engine crew by signals, audible or light, or indication conveyed to the train dispatcher; or trip a device for spraying a washable white paint over the defective car.

It is contemplated that these units can be installed at strategic points along the right-of-way conforming to the standard clearance to take advantage of patterns in hotbox recurrence during extremes in seasonal temperature, and to insure maximum protection to freight movement during long, high speed runs. *Camef Equipment Corporation, 224 South Michigan, Chicago.*

Generator to Supply Cleaning Steam

The Upgrader Jr. Model 5090 steam cleaner can now be had with a four-cycle gasoline engine, making it completely portable for cleaning jobs away from the shop where electric current is not available. The cleaner will also continue to be made with an electric motor to drive the water pump and blower.

The cleaner builds up effective steam cleaning pressures in less than two minutes, with a forced draft fire that burns kerosene or No. 2 oil and consumes 1½ gal of fuel per hour. It is mounted on two shop wheels with semi-pneumatic tires, with an extended handle so the unit can be moved about a shop or placed on a trailer to be towed by car to do isolated cleaning jobs.

Cleaning is done with wet steam at 70 to 120 lb pressure, with or without cleaning solution, which does not go through the coils but is siphoned out of a separate container by the steam and mixed with the steam in the cleaning gun. The steam cleaning gun has an expanded metal handle to keep the operator's hands from getting hot. The gun is attached to 20 ft of steam hose and an acid-resisting cleaning solution hose.

The Upgrader Jr. weighs 250 lb ready for shipping and is 37 in. high, 41 in. long and 21 in. wide. *Vapor Heating Corporation, Railway Exchange, Chicago 4.*

Clear Alkyd Varnish

This varnish, resistant to scrubbing and abrasion, dries in 2-½ to 3 hr and surfaces coated with it can be put into service after 12 hr. Formulated from a clear alkyd resin, the varnish may be used on wood, metal, and linoleum, for either interior or exterior surfaces.

Waterspar Varnish Extra Pale Clear, is for use where a minimum amount of discoloring is desirable, either new or after aging. As a linoleum or linowall coating, it offers protection without discoloring delicate patterns.

It is said to be free-flowing and easily applied by brush. The product may also be used as a sealer on plywood, knotty pine paneling and other wood surfaces by thinning with mineral spirits. *Paint Division, Pittsburgh Plate Glass Company, 632 Fort Duquesne Boulevard, Pittsburgh 22.*

Industrial Flashlights

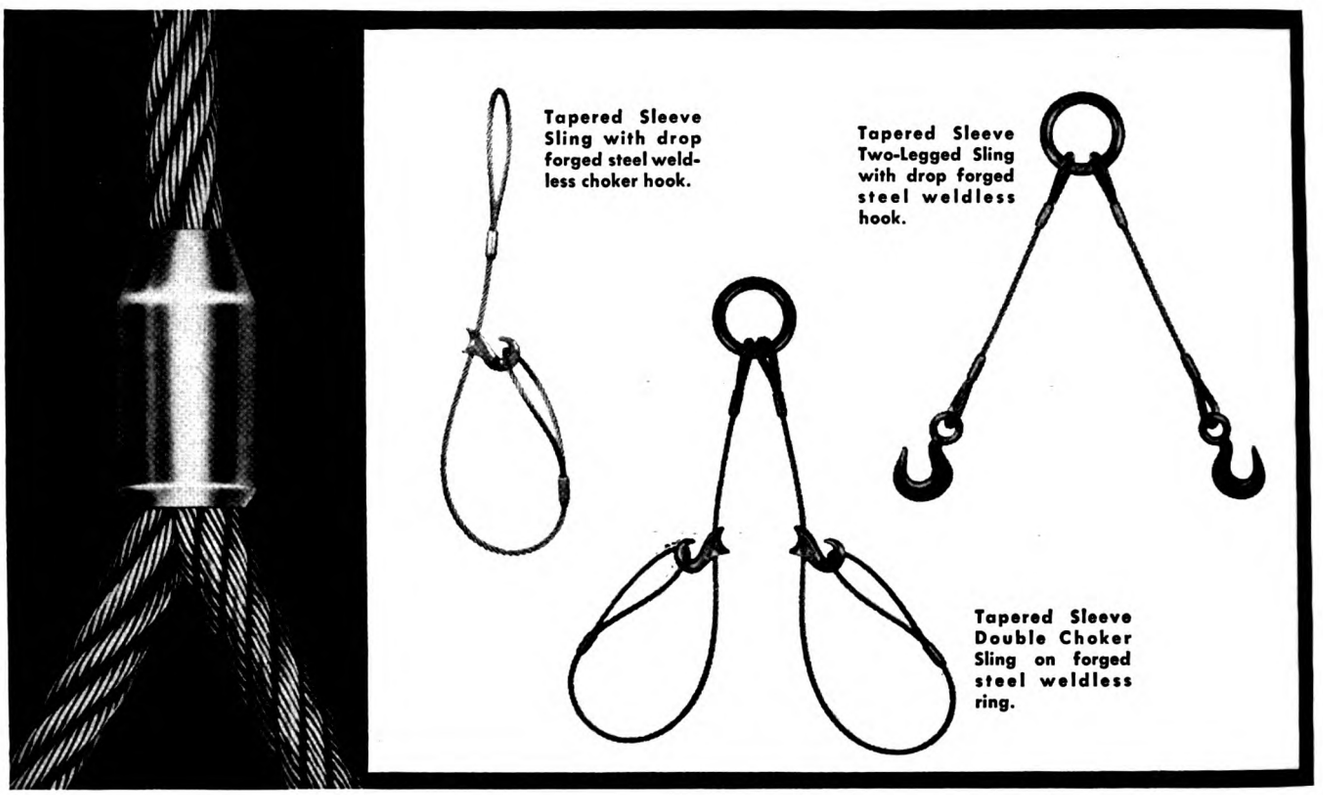
These units are recommended for use by railroads and other industries requiring rugged dependability long life and safe operation. They have been made available

(*Continued on page 89*)

THEY'RE ALL STEEL—RESIST KINKING, CRUSHING—

ROEBLING SLINGS

WITH TAPERED SLEEVE



ROEBLING SLINGS are made of Preformed "Blue Center" Steel Wire Rope with independent wire rope core. *All steel,* they have top resistance to kinking and crushing . . . are easy to handle all through their working lives. Their tapered sleeve splices are strong as the rope itself and require no allowances.

What's more, the streamlined tapered sleeves won't "hang up" on loads or other equipment. All strand ends are permanently secured beneath the sleeves; no strand or wire ends protrude to cause injury in handling.

Roebling Slings are delivered ready for work. They can be furnished as chokers or in any multi-leg construction with a galvanized steel thimble with attached hook, link or shackle. Write for descriptive folder, and adopt Roebling Slings for new efficiency. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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have some very special advantages. They're extra kink-resistant . . . easy to handle . . . their broad, flat bearing surface protects the load and prolongs sling life. Write for copy of the "Sling Data Book" that describes "Flatweaves" and gives information of real value to every sling user.

EDITORIALS

The Boiler Makers Adjourn

It is with deep regret that we record the passing of the Master Boiler Makers Association as an independent organization after having served the railroad industry for almost 53 years. Because of the evolution from steam to diesel power, the association, which came into being in November 1902, found itself in a position, through loss of membership and economic considerations, where it could not continue.

On March 11 this year, two members of the Boiler Makers Executive Committee appeared before a meeting of the Coordinated Mechanical Committee at Chicago to outline the association's difficulties and recommend disbandment. Immediately thereupon, the Executive Committee of the Locomotive Maintenance Officers Association extended an invitation to the membership of the Boiler Makers Association to join its ranks and revised its program to include a session which the Boiler Makers can attend as a separate group.

No announcement of this kind would be complete without paying tribute to the man who has been the motivating force behind the association since 1930—Al Stiglmeier. By force of personality and seemingly inexhaustible energy, Al kept the Boiler Makers together during depression years and to the point where the passing of the steam locomotive curtailed the activities of the association.

Where Do You Find Out?

In a recent issue of this magazine, we quoted an electrical engineer as having said, "You could have the whole damn mechanical department on one of our passenger trains and if the locomotive broke down, the first thing they would do would be to send for an electrician." It was suggested that the supervisor who, in most cases, has come up through the mechanical department should know something about things electrical and that if he does, he should at least be able to diagnose the trouble before the electrician arrives.

One basic difficulty is that many mechanically trained men seem to suffer from a mental block when they approach an electrical problem. Perhaps another difficulty involves a matter of protocol. The electrical department has long run errands for both the mechanical and engineering departments, and the mechanical department man may feel that his position is made more secure if he avoids any possibility of disclosing his lack of technical knowledge and insists on the services of the electrician—lets him make the mistakes, if any. On the other hand, in the earlier days, when applications of electrical equipment were few, the electrician sought to emphasize his importance by making a mystery of the things he did.

This situation is one which cannot continue. Things mechanical and electrical are so interdependent that not only the superintendent, but also the supervisors and the maintainers must know the job from both ends, even though they themselves are specialists.

There are many places to find out what you need to know. The builders' schools explain all the details of their locomotives. They show how to run them and how to find and remedy trouble when it occurs.

The railroad schools, abetted by instruction cars, carry the work a little farther. The builders teach perhaps ten per cent of the railroad staff, and the railroad schools extend it to everyone who needs to know. They deal specifically with equipment used by that railroad and with that railroad's operating requirements.

The diesel clubs around the country really get down to cases. Among other things, they bring the railroad operators in contact with suppliers' representatives where the latter get a going over which can be survived only by a rugged individual. This somewhat rough, but effective, procedure has done much to improve equipment and to increase the operator's understanding of how to use it.

Eventually every good man wants to know why as well as how. An excellent source of such information is the "How to Keep 'Em Rolling" series, now available in book form. In simple language, it explains the reasons why electrical equipment performs as it does and tells why definite operating practices are necessary. It has saved many a man the embarrassment of asking a question for which he should know the answer. Most important, it is fundamental to all makes and kinds of locomotives and will never go out of date.

Engineering and design, and studies of such subjects as flashovers and wheelslip, are handled in a practical manner by the Land Transportation Committee of the American Institute of Electrical Engineers. Membership in this organization provides an opportunity for one to round out his knowledge of diesel and other electrical equipment used in transportation service.

Finally, membership in the Electrical Section, Association of American Railroads, is a must for every railroad man who has an interest in the development of standards and recommended practices, and who wants to keep in contact with the men in his position on other roads. Committee work is equally beneficial to the railroads and to the men preparing the reports.

This magazine will keep you in touch with current developments. It will also help you with everyday work and will keep you informed on what other railroads are doing. The "How to Keep 'Em Rolling" series will be supplemented by a second series to be called, "Roll Them Out Like New." This will take you into both the railroad shops and the outside service shops.

Until quite recently, information on diesel electrical equipment was scarce and something less than top quality. There are, of course, other sources than those here described. The point is that it is now available, and he who wants it may have it in almost any form which suits his particular requirements.

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New CINCINNATI HYPOWERMATICS are the world's finest heavy duty automatic milling machines . . . they are worthy of the immediate attention of your replacement committee. ¶ These new machines are built in 42 sizes, plain and duplex styles, 36" to 168" table traverse, up to 50 hp drive. Outstanding time and effort saving features include Dynapoise overarm, Hydramech table drive, backlash eliminator, automatic spindle stop. More details in catalog No. M-1871. Write for your copy today.

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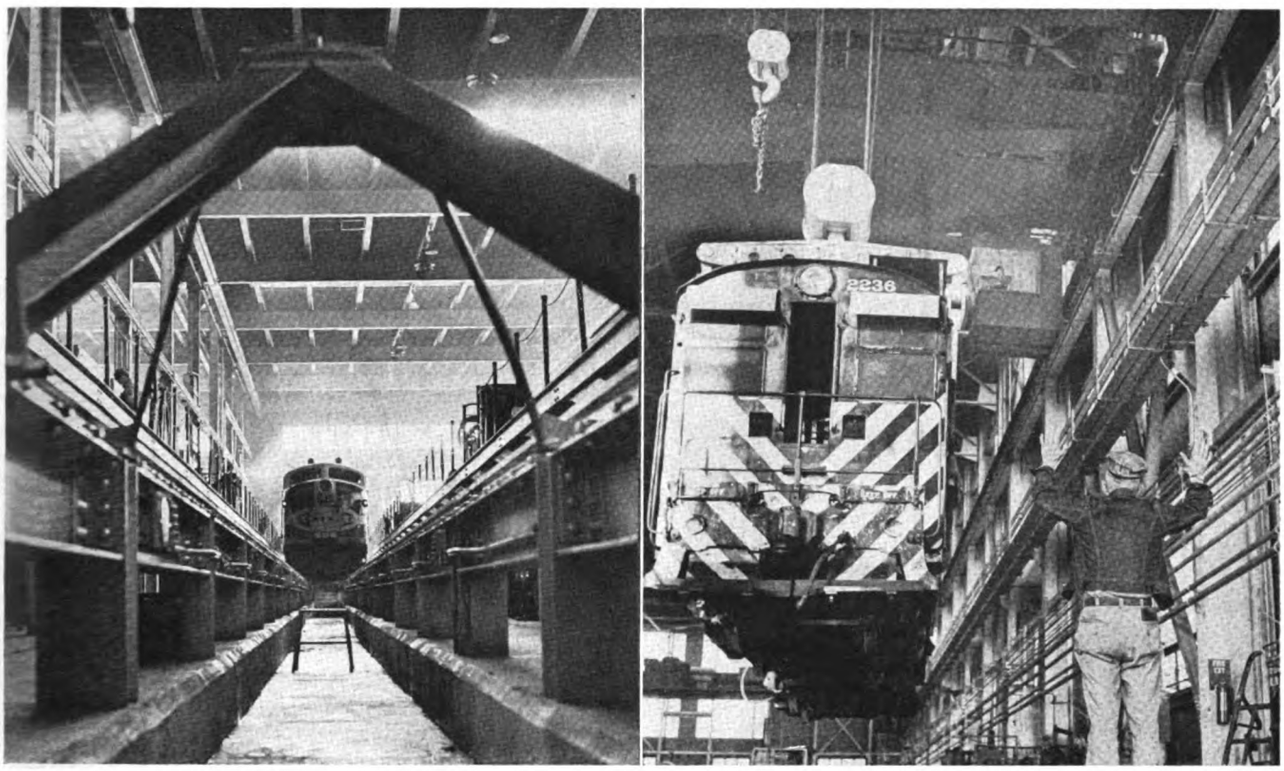
MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES

FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



WORM'S EYE VIEW (LEFT) of road freight diesel entering the big new Argentine shop—Two Whiting cranes carry 244,500 lb. of locomotive (right)

Pooled Service . . .

The Secret of Santa Fe Success . . .

With Diesel Power

How new diesel shop facilities at Argentine, Kan. help in general running maintenance program.

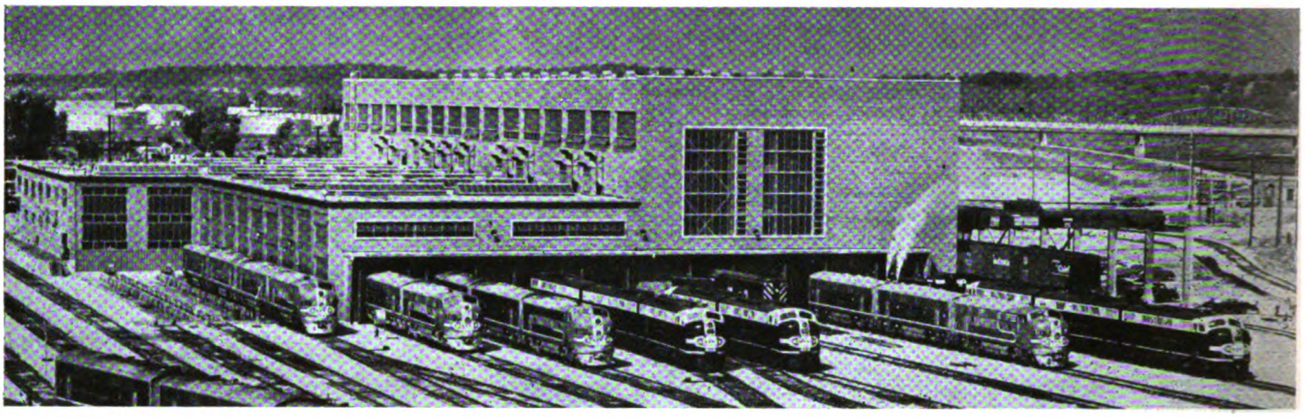
Any real appreciation of the important part played by the big, new diesel maintenance shop and terminal of the Santa Fe at Argentine (Kansas City), Kan., is contingent upon understanding how effectively this completely dieselized major Class 1 railroad has succeeded in pooling its inventory of diesel-type motive power.

Passenger locomotives are operated in two pools protecting all service for the system. The large transcontinental passenger pool operating between Los Angeles-Chicago-Galveston (Tex.) consists of 219 units with maintenance centered primarily at Barstow, Cal. The second passenger pool of 20 units operates out of Chicago to Oklahoma City, Dallas, Tex., and Paris, with maintenance centered at Chicago.

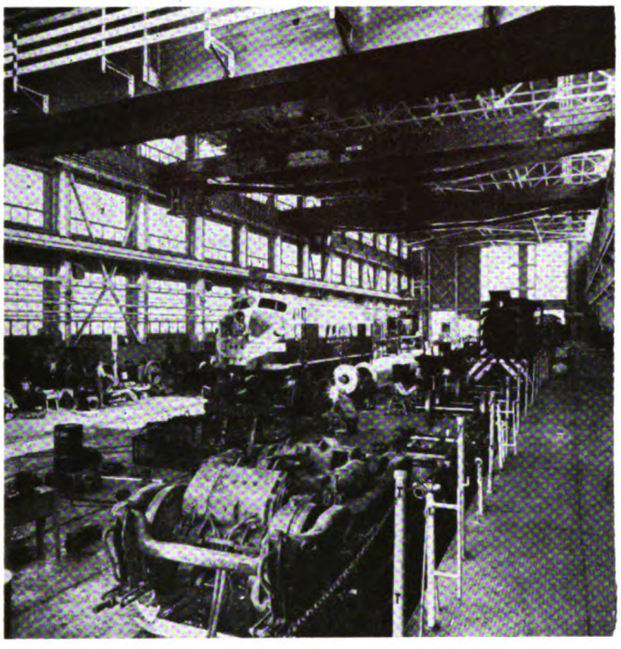
Freight locomotives are operated primarily in five pools. One, known as the Barstow Pool, consists of 324 Type F7 units operating between Barstow-Belen (N.M.)-Clovis (N.M.)-Waynoka (Okla.) with running maintenance centered at Barstow and heavy maintenance at San Bernardino, Cal.

The second, the Cleburne (Tex.)-Argentine (Kansas City)-Corwith (Chicago) Pool, consists of 357 units. This pool also handles main-line freight business between Chicago-Waynoka and Chicago-Denver-Amarillo-Clovis-Sweetwater (Tex.), with running maintenance centered at Argentine and Cleburne and heavy maintenance at Cleburne.

The third pool consists of road-type switchers operating south of Cleburne to Silsbee and Galveston, and west to Sweetwater. There are 90 units in this pool with all maintenance centered at Cleburne. The two other freight pools cover the territory north of Bakersfield, Cal., and



LOW BAY (LEFT) is for running maintenance and high bay (right) for annual inspections



HIGH-BAY AREA where annual inspections are made

LOW-BAY AREA especially equipped for running repairs

south of San Bernardino, and each comprises some 41 road-type switchers with running maintenance centered at Richmond, Cal., Bakersfield and San Bernardino, and with heavy maintenance at San Bernardino.

Diesel power for all other relatively short territories, which also consists of road-type switcher units, has running maintenance centered at the various terminals where the locomotives are assigned, with heavy maintenance handled at the closest large shop.

This system pooling of power permits the majority of all running repairs covering routine maintenance, mileage, and form-inspection work, to be handled at three points; namely, Barstow, Cleburne and Argentine. Road-type switchers and yard engines receive their running maintenance at division points where assigned. Heavy repair work, with minor exceptions, is all handled at the two main shopping points, San Bernardino and Cleburne.

Improvements at Argentine

To strengthen its running maintenance facilities for the Cleburne-Argentine-Corwith pool the Santa Fe has constructed at Argentine what is said to be one of the most modern diesel servicing and repair shops in America.

Featuring a large bay for annual inspections, a running repair bay for routine semi-monthly, monthly, quarterly and semi-annual inspections, a cleaning room, machine shop area, storehouse facilities and offices, the main structure of the new shop is a two-story building constructed of concrete and brick, covering an area approximately 400 by 238 ft servicing facilities and feed tracks, including a balloon track which circles the shop building, complete the new installation.

For annual inspection work, the large bay of the new shop contains three tracks with full-length inspection pits on 30-ft. centers, allowing plenty of room for working diesel units between the tracks. One track contains a two-level ramp for handling repairs to all types of diesel locomotives. The bay, 400 ft long by 100 ft wide, is used for annual inspections on 130 to 150 switch engines and road-type switch engines as well as seven passenger engines. All wheel work for freight engines is handled in this area. Three Whiting cranes include two 125-ton with 30-ton auxiliaries and one 15-ton crane with 5-ton auxiliary which service the entire room.

The two 125-ton cranes are capable of picking up an entire locomotive unit and moving it to any desired point

in the shop area over the tops of the other locomotives. Some converted steam locomotive shops have comparable crane capacity but this is reportedly the first time a railroad diesel shop has been equipped to lift complete locomotive units.

There are four stalls with pit tracks inside the building in the running repair bay where semi-monthly, monthly, quarterly and semi-annual inspections are preformed on approximately 400 diesel units. Each of the two pairs of pit tracks is serviced by a 5-ton overhead tram-beam hoist. In addition, two stalls outside the building are equipped with ramps for overflow running repair work.

One of the inside stalls has a two-level ramp for switch and road switch engines, and all stalls are equipped with lubricating oil supply and drain lines, clear water lines, treated water lines for cooling systems, power tool electrical outlets, and air lines. All lines are color coded.

Fluorescent lights are under all ramps and pit lights are so arranged that all lights for any stall can be used at one time, or any section can be used individually. Controls for the lights are located under the ramps and at control button stations at each end.

Both the large bay and the running repair bay are equipped with radiant floor hot water heat. The entire building is equipped with low pressure steam radiators and de-icer radiators are in the bay areas for thawing snow and ice from the locomotives in winter time.

Removal of exhaust gases from the inspection bays presented a serious problem to engineers designing the shop. Blowers in the ceiling were not considered practical by themselves because of the type of heating system planned.

Exhaust gases rise when hot and settle again as they cool, and it was decided to take advantage of the rising gases for their expulsion. Fresh air intakes were placed at intervals along the side walls of the shop at a height approximately that of a locomotive, and ceiling fans were installed. The net result of this arrangement is that fresh air from the intakes comes into the building below the exhaust gases as they rise and carries them to the fans above. The air at floor level remains relatively still and is not contaminated. Called a "restricted circulation system," the plan is said to be the most advanced method of air purification in American industry.

Reconditioning of pistons, liners, rods, injectors, fuel pumps, governors, cooling fans, traction motor blowers, water pumps, lubricating oil pumps and all miscellaneous small parts pertaining to the operation of a diesel locomotive is accomplished inside the small parts shop area. Electrical parts such as contactors, relays, train control governors, train stop receivers, etc., are also repaired and rebuilt in this shop.

Offices Air-Conditioned

The master mechanic's offices. located on the second floor of the shop building, are well lighted and provide his staff with a modern, comfortable atmosphere in which to work. His and the general foreman's staff's are located here and handle all correspondence pertaining to the shop operation. The offices are completely air conditioned.

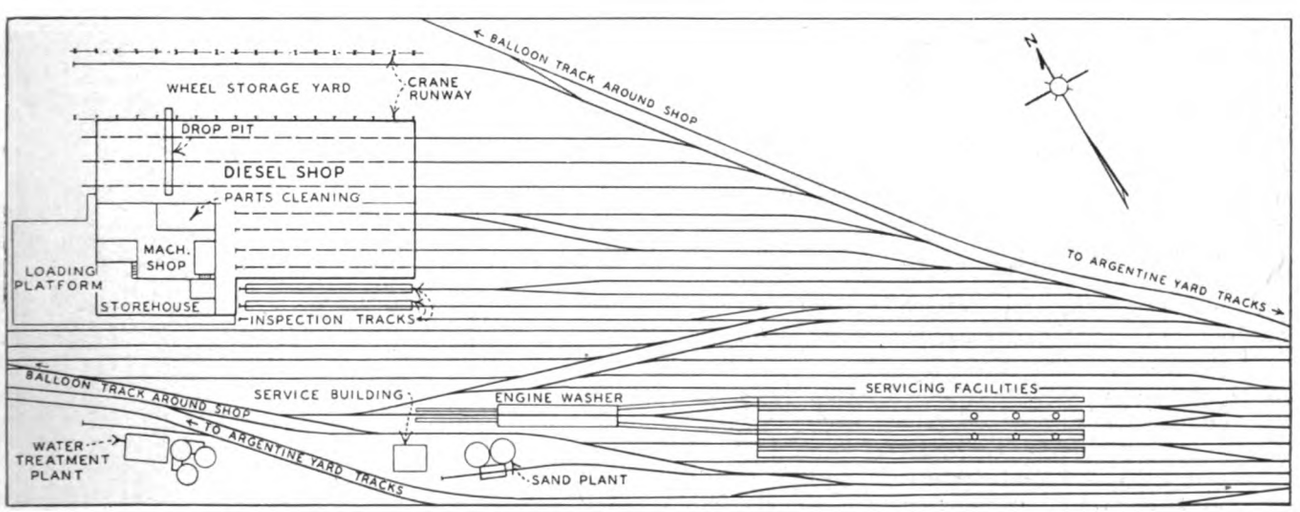
Also on the second floor is a large locker room containing a section with tables for lunch-time use by employees. The stores department maintains a storeroom on this floor where all heavy parts are kept for repairs needed during annual inspection work on diesel locomotives. Serviced by two elevators, the storeroom is approximately 92 by 100.

Store department offices are on the first floor along with running repair facilities, where all small parts for daily and routine running repairs are handled.

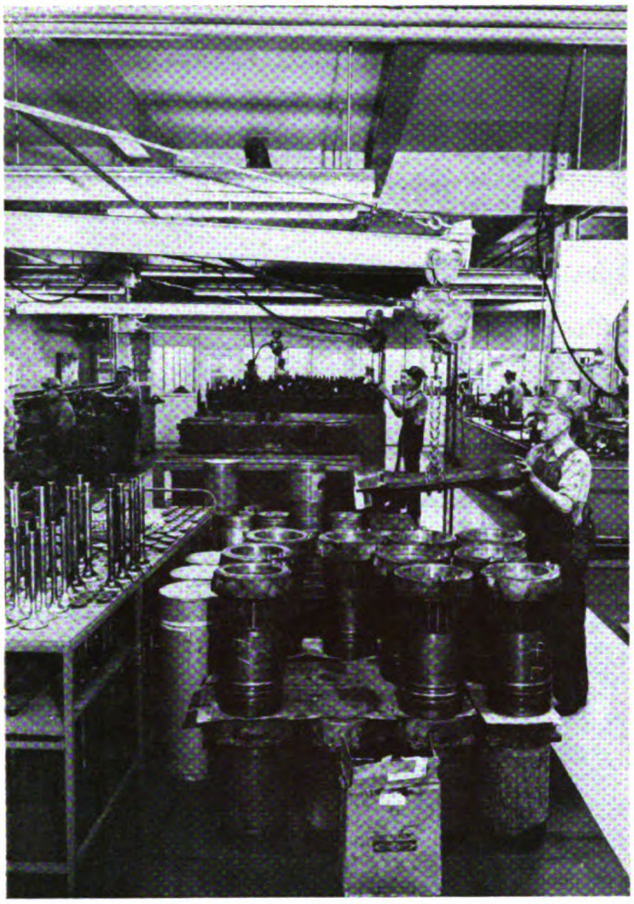
The diesel shop office force is housed in two air-conditioned offices on the first floor. Here it is that engines are dispatched and all records pertaining to inspections and repairs are kept. The nerve center for the communications system is housed in the office, and time cards are prepared and filed here.

Engine parts and filters are cleaned in the cleaning room located next to the small parts section. For running repair work approximately 70 lubricating oil filters are cleaned and repacked each day and 400 engine and carbody filters are cleaned, dipped and spun dry. The cleaning section is equipped with tanks for cleaning pistons, heads, liners and small engine parts and with a Farr filter cleaning machine.

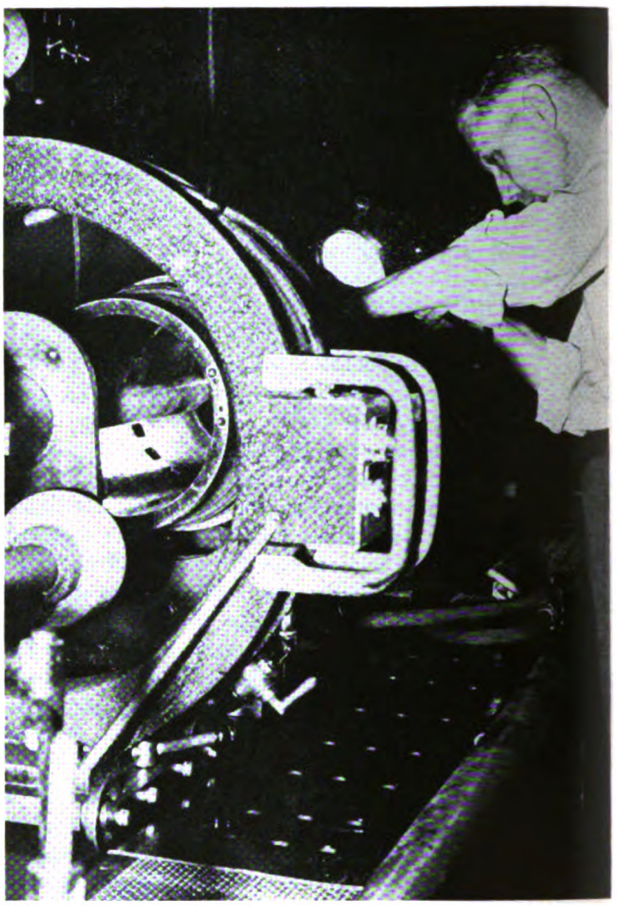
Outside the main building alongside the large bay area is an outside crane section approximately 80 by 425 ft in size. Serviced its entire length by a 30-ton 5-ton crane,



NEW ARGENTINE DIESEL FACILITIES include a shop, 16-track storage and ready yard and a 3-track servicing station



ENGINE DETAIL PARTS are reconditioned in this department which has 500-lb. hoists on jib cranes for handling heavy materials



MAGNAGLO INSPECTION UNIT used to check liners, heads, rods, pistons, etc., for possible defects

the area is used for loading and unloading wheels, traction motors, generators, etc., from freight cars, and also serves as a wheel storage area. Improvements to this area are planned in the future.

Servicing Facilities

All locomotives arriving at Argentine are serviced by the facilities adjacent to the main shop building. Sand towers, truck spray, fuel rack and washing machine are aligned for progressive operations.

The first stop is at the sand towers. Six sand towers (three for each of the two service tracks) have a capacity of ten tons of sand each. The sand flows from the towers by gravity through hoses into the locomotive sand boxes.

After sanding, locomotives move through the automatic truck spray where cleaning solution is applied to the trucks. The solution is allowed to remain on the trucks for from 10 to 15 min while refueling takes place, in order to dissolve grease and road grime from the undercarriage.

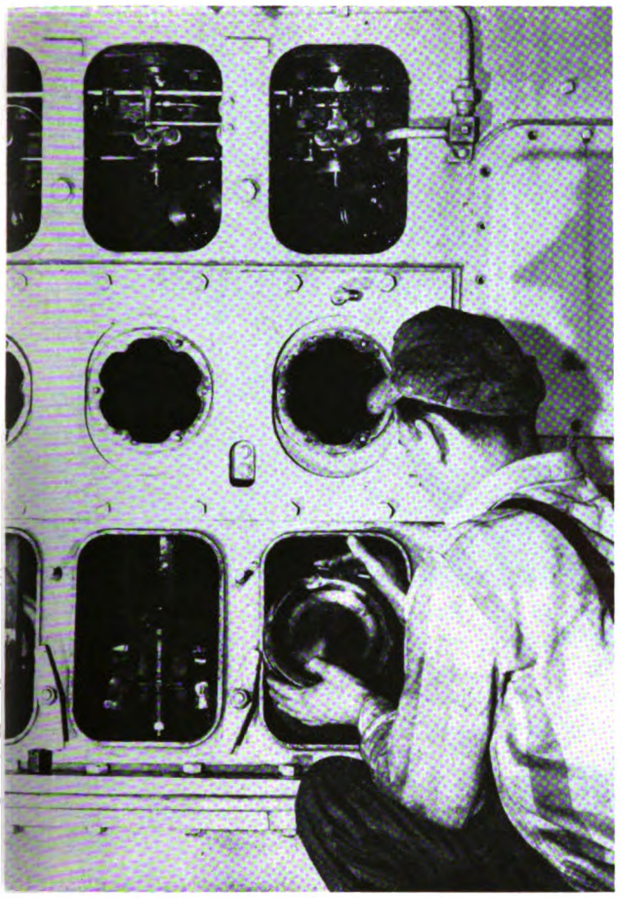
At the fuel rack, fuel and lubricating oil are replenished, and the steam generator water-supply tanks filled. Each unit receives up to 1,200 gal of fuel and up to 1,800 gal of de-mineralized water. Engine rooms are cleaned, brakes adjusted and miscellaneous inspection work is performed here.

Trucks are rinsed with a water spray under 300 lb pressure to remove the cleaning solution, and the locomotive moves into the Whiting washing machine where rotary brushes wash the carbody proper. A final rinsing with water and the locomotive is again ready for road service.

Eastbound single-cab locomotives proceed around the balloon track to head them in the proper direction, and westbound units are switched to the parking area north of the fuel rack, eliminating much unnecessary handling in placing locomotives on the ready track.

About 650 tons of sand, 1¾ million gallons of fuel

REFUELING STATION where water tanks are also filled



INSTALLING PISTON in the engine of a Fairbanks-Morse diesel switcher—these pistons are removed and overhauled every two years

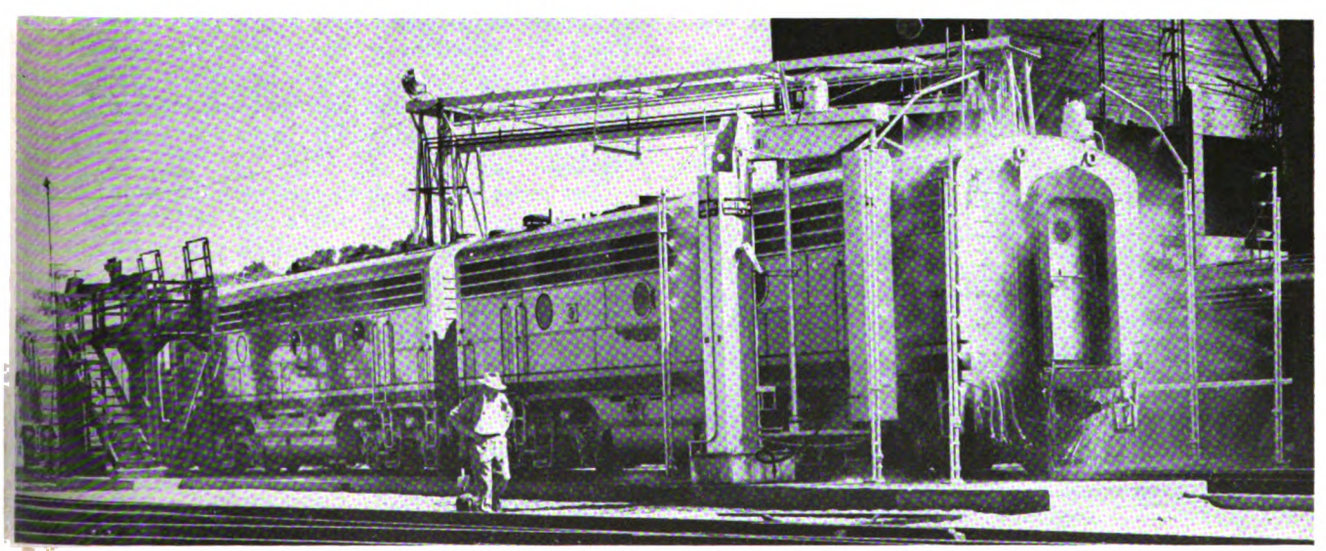
REPLACEABLE MICHIANA FILTER SOCK being applied before placing filter in storage rack at left

and between 40 and 60 thousand gallons of lubricating oil are distributed by these facilities each month. From 140 to 180 diesel units are serviced each 24 hours, or an average of approximately one every 10 min around the clock.

High pressure pumps for the truck spray in the servicing area as well as pumps for cleaning solution, water and lubricating oil distribution are housed in the service building located near the service area. Fuel oil, stored in underground tanks, is pumped to the fuel rack as needed.

Air compressors for maintaining pressure in air hoses throughout the shop area are in the power house near the main shop building.

All sections of the shop and servicing areas are reached by an intercommunication system, which is arranged to allow direct contact with the railway's main switchboard at Argentine.



WHITING LOCOMOTIVE WASHING UNIT as installed at the Argentine diesel servicing track

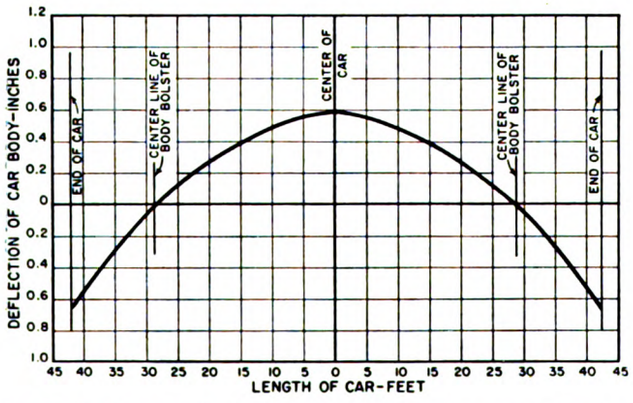
Compression test machine from the beam end—Santa Fe baggage car being tested.

Squeeze Tests on ACF Cars

Full test requirements met by stainless-steel baggage car for the Santa Fe and aluminum dome-coach for the UP

The passenger-car, compression-test machine* installed at the Association of American Railroads Research Center, Chicago, was used for the first time August 17 in testing a Union Pacific 85-ft dome-coach with aluminum-alloy superstructure, built at the St. Charles, Mo., shops of ACF Industries, Inc. The second car, put through the test machine on November 11, was a Santa Fe 74-ft stainless-steel-sheathed baggage car, constructed at the Berwick, Pa., plant of the same builder. Both cars withstood over 800,000 lb end pressure with deflections well within AAR limits, practically no permanent set and no signs of distress in the car structures.

* A million-pound machine formerly owned and used by the Pennsylvania at its Altoona test plant.



Longitudinal compression test of UP aluminum dome-coach built by ACF Industries

For both tests, the cars were received at the AAR research laboratory in skeleton form, the dome-coach being loaded with 82,440 lb of sand in bags and the baggage car with 21,960 lb to compensate for interior trim fittings and under-car equipment. After placing each car in the test machine, longitudinal pressures applied on the center sill end at the back follower stop, were recorded in pounds as calculated from a hydraulic pressure gage. Car body deflections at the center with respect to the body bolsters were measured by means of wire and mirror gages, side sheet buckles being measured with a dial gage and inside-width variations were carefully checked.

Test procedures for both cars were the same. The test in each case was started with a load of 132,536 lb pressure applied against the rear draft gear stop and continued in progressive steps until a total of 17 tests were made with a final load of 839,396 lb. Each test was started at zero after the load of the preceding test was released. Car body deflections over the entire load range were recorded and subsequently shown in tabular and chart form, as illustrated.

In the case of the UP aluminum dome-coach it will be noted that the average deflection between body bolsters on the maximum load of 839,396 lb was 0.60 inches which is well within the limit of 1.00 in. at 800,000 lb as required by the AAR Specifications shown on page

C-49-1946 of the Manual of Standard and Recommended Practices.

References to the right or left side represents the side of the car viewed by facing the car from the press end of the test machine. The vestibule or B-end of the car was located at the press end of the machine during the test.

Observations were made under, outside and inside the car during the progress of the test. No defects were found under the car on the center sill or draft gear stops either during the test or on examination of these parts after the test was completed. Buckling of side sheets, which ranged from 3/8 in. to 3/4 in. in a span of 36 in. while the maximum load was applied, mostly disappeared when the load was released. No permanent set of any consequence developed during the test.

On the basis of results observed, the official report states that this car satisfactorily meets AAR test requirements for buffing strength.

Compression test of the Santa Fe baggage car showed an average deflection between body bolsters of 0.40 in. at the maximum load of 839,396 lb which may be compared with 0.60 for the somewhat longer dome-lounge car.

Observations made during the test showed no defects under the car or on the center sill or draft gear stops. Buckling of the side sheets ranged from 7/32 in. to 3/8 in. in a span of 36 in. while the maximum load was applied and mostly disappeared when the load was released. A slight buckling was noted inside the car during maximum load with slight permanent deformation when load was released.

There were no appreciable permanent deformations either inside or outside of the car.

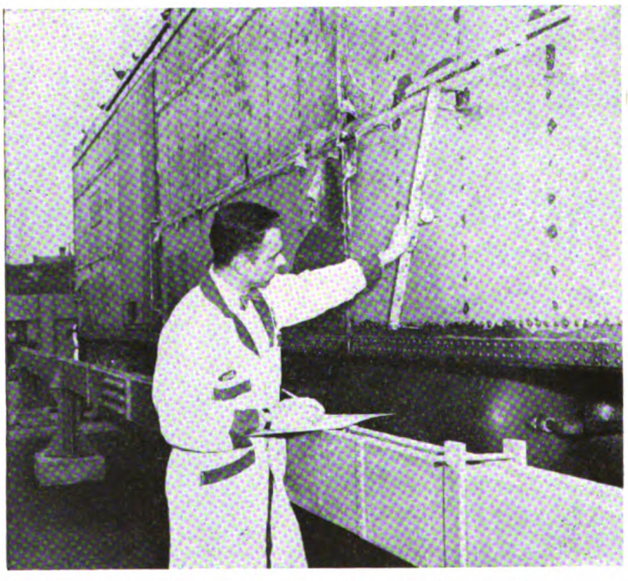
The test report showed that this car also has adequate buffing strength to meet the AAR test requirements.

DEFLECTION OF UP DOME-COACH CAR BODY UNDER COMPRESSION LOAD, IN.

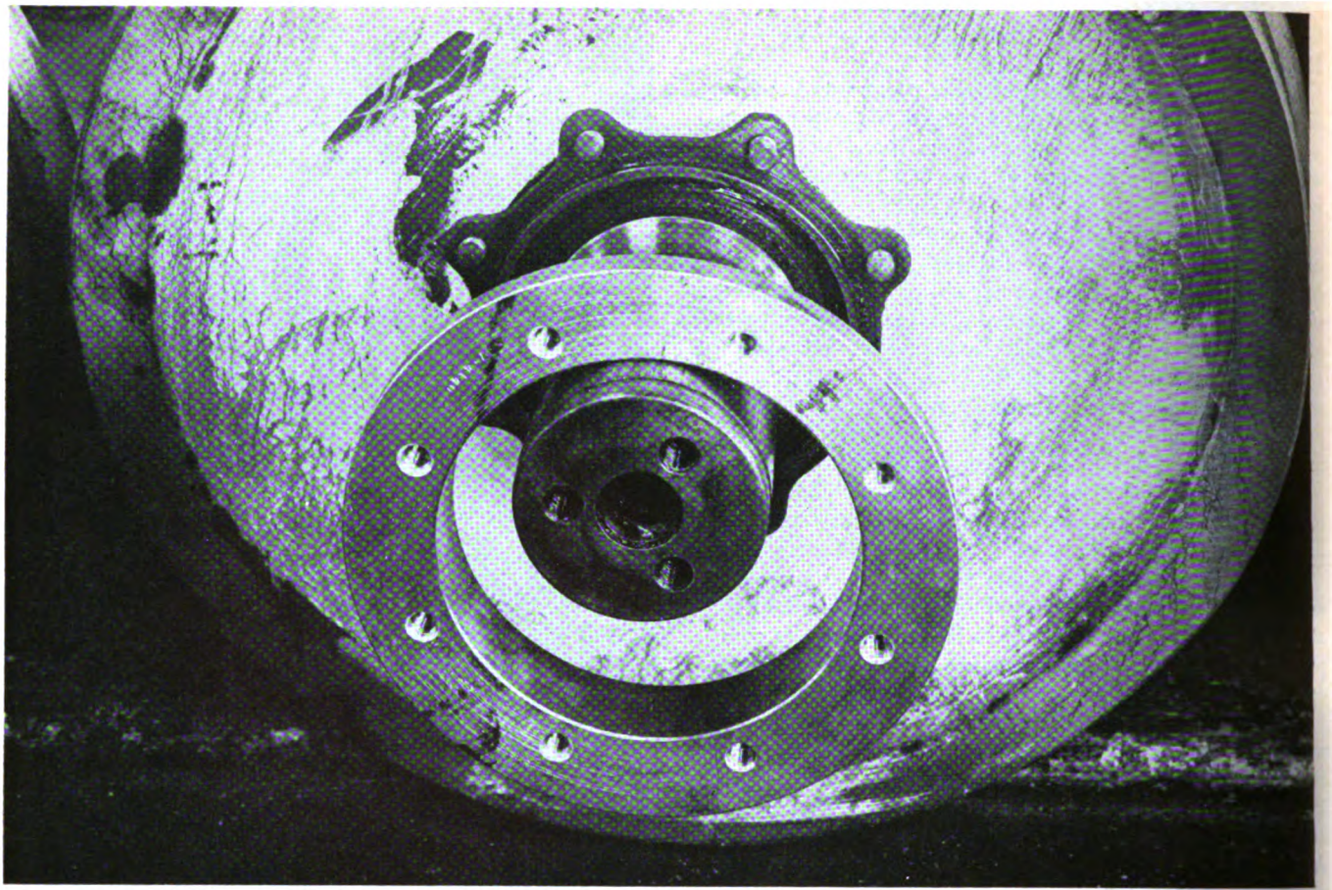
Test No.	Pressure, lb., as calculated from hydraulic pressure gage	Beam end of test machine at center line of body bolster at stub end of car		At center of car		Press end of test machine at center line of body bolster at vestibule end of car		Av. amount of deflection between body bolster
		Right side	Left side	Right side	Left side	Right side	Left side	
1	132,536	.08	.10	.16	.18	.08	.10	.080
2	176,715	.10	.12	.24	.22	.12	.12	.115
3	220,894	.14	.14	.30	.28	.14	.14	.150
4	265,073	.16	.18	.34	.36	.20	.18	.170
5	309,251	.20	.22	.42	.42	.20	.22	.210
6	353,430	.22	.24	.48	.48	.24	.26	.240
7	397,609	.26	.28	.54	.54	.28	.28	.265
8	441,789	.30	.32	.60	.62	.32	.32	.295
9	485,966	.34	.36	.68	.68	.34	.36	.330
10	530,145	.36	.40	.74	.76	.38	.40	.365
11	574,323	.40	.42	.82	.82	.40	.42	.410
12	618,502	.46	.48	.92	.92	.48	.48	.445
13	662,681	.48	.52	.98	.98	.52	.52	.470
14	706,860	.54	.56	1.04	1.06	.54	.56	.500
15	751,039	.58	.60	1.10	1.14	.60	.60	.525
16	795,218	.62	.64	1.20	1.24	.64	.64	.585
17	839,396	.66	.66	1.24	1.28	.66	.66	.600

Hydraulic pressure or "business" end of the test machine.

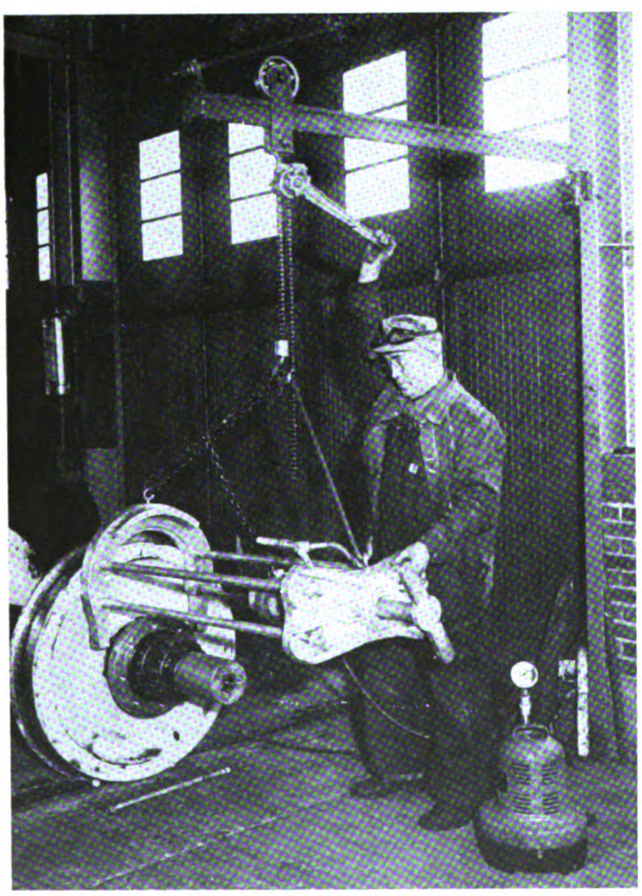
Mirror gage at bolster used in checking car-body deflection.



Dial indicator arrangement for measuring side-sheet buckle.



Pulling ring before attachment to the back cover plate with eight studs



How the OTC puller is applied with pulling shoe over the pulling ring

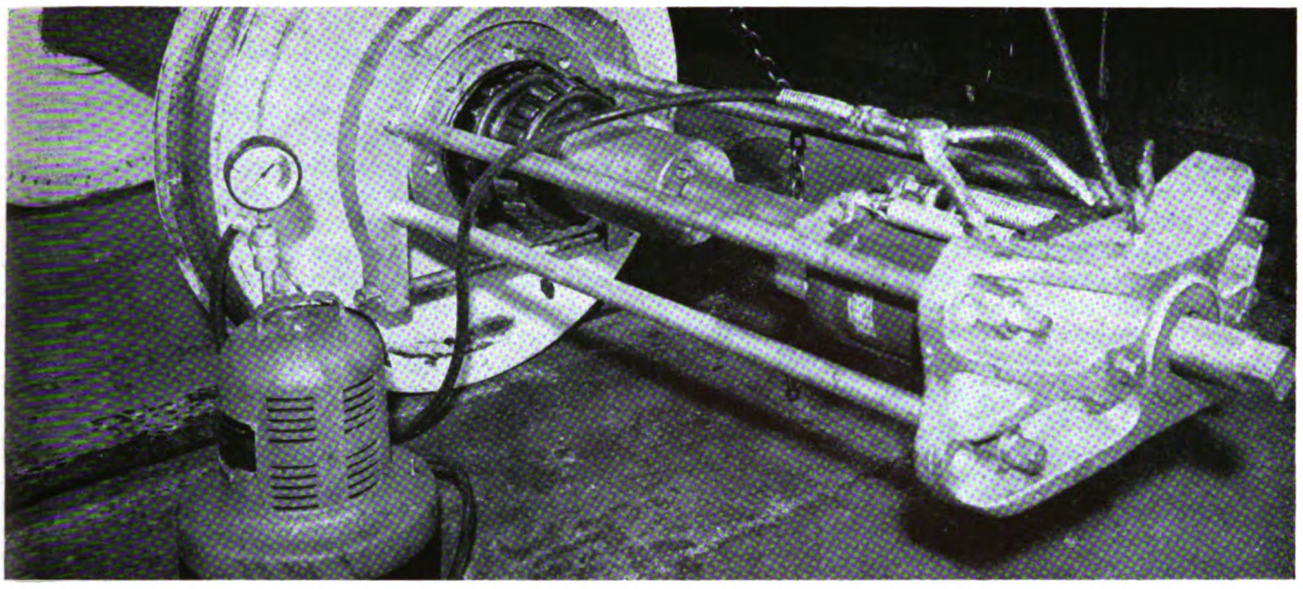
Santa Fe Uses New

Roller-Bearing Puller

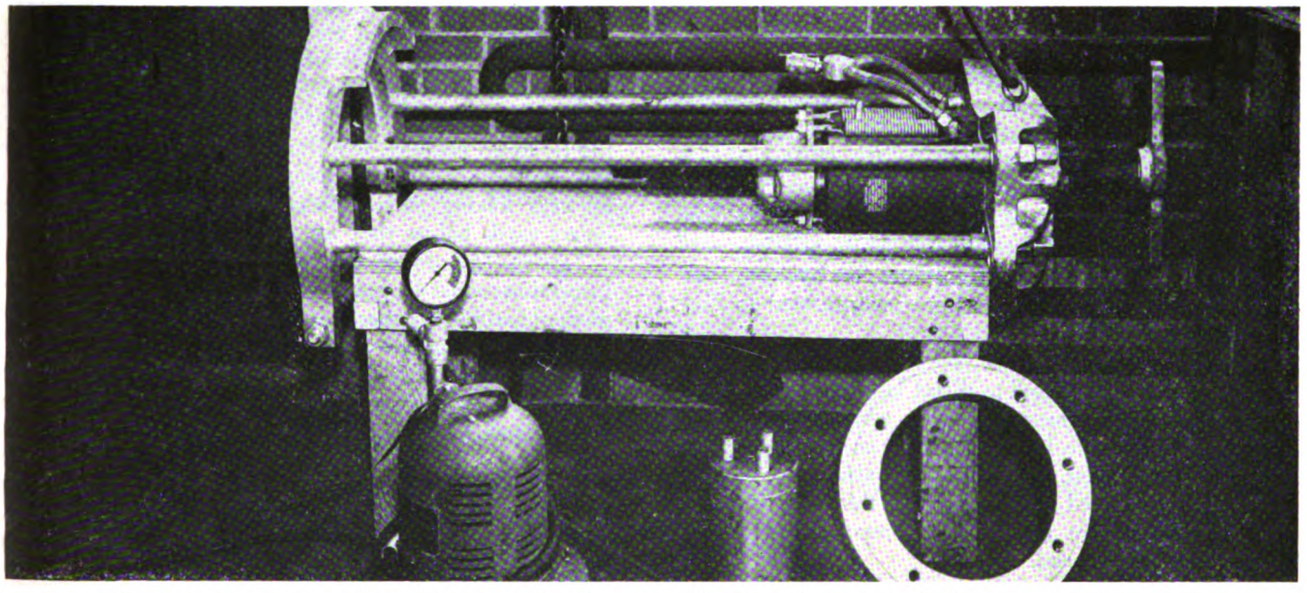
A new hydraulic pulling device of the type illustrated is now being used at three shops on the Santa Fe for removing axle journal roller bearings without pressing off the wheels, and attachments are available so that the puller may be used for either Timken or SKF bearings and for pressing on the roller bearings, as well as pulling them off. The puller works equally well on passenger-car, freight-car or diesel locomotive bearings.

The particular puller shown is installed at the 18th Street, Chicago, wheel shop of the Santa Fe where it is used exclusively for removing bearings, as a wheel press is readily available for re-installing them. Once the puller is assembled, it can be applied on one end of an axle and the roller bearing pulled in 20 min or less. The job is thus done quickly and easily with no distortion or damage to the back cover plate or bearing which may be cleaned, inspected and returned to service.

Another important advantage is that a programmed internal inspection can be made without disturbing the wheel fit, while in previous practice the wheel had to be pressed off to remove the bearing for programmed careful internal inspection. This frequently involved a turning and refitting operation as well as pressing the wheel on the axle again at appreciable cost in time, labor



OTC 100-ton twin hydraulic puller set up ready to remove roller bearing



Where roller-bearing puller is kept when not in use—Hydraulic pump guide tube and pulling ring in foreground

and material. With 1,600 roller bearings to be changed to new units having modified housings, enclosures and fingers, the Santa Fe expects to save the first cost of these three hydraulic pullers in six or seven months.

The device described here is the OTC roller-bearing puller, made by the Owatonna Tool Company. It has capacity to develop 100 tons pressure in twin hydraulic cylinders; more than enough to start obstinate bearings which have been in service a long time and may take 50 tons or more to break loose. After inspection and reconditioning, the bearings are generally re-applied at 25 to 30 tons pressure.

The sequence of operations is shown in the illustrations. A circular pulling ring is first secured to the roller bearing back cover plate by eight studs. A guide tube with 1⅝ in. tapped center hole is bolted to the end of the axle with long studs. The assembled puller is then lifted with a small jib crane and ratchet chain hoist into position over the axle and lowered with the pulling shoe between the wheel and the pulling ring. The puller screw is adjusted by hand to the guide tube center hole. a tie bolt applied in the bottom of the pulling shoe and hydraulic pressure supplied to the puller head from a portable electric-driven centrifugal pump and flexible metallic connections. This pump operates on any 110-volt circuit and is controlled by a switch in the base. The operator simply takes up slack in the puller until pressure is exerted between the end of the axle and the back cover plate, this pressure being gradually built up as shown on the gage until the roller bearing breaks loose and is pulled off the journal.

While a light and efficient tubular hoist frame is available for use with the OTC puller, the Santa Fe has installed the small jib crane, illustrated, which easily places the puller in position for lowering onto the journal. When not needed, the puller is just as easily swung out of the way against the shop wall where it is supported on a wooden table off the floor and well out of the way.

Interchange Rules Revisions—1955

Each year the AAR Mechanical Division makes the necessary revision to the Interchange Code of Rules and the high spots of the changes are reviewed before groups of car men in different parts of the country so as quickly to acquaint all those concerned with the revised rules. To this end the Eastern Car Foremens' Association, New York, set aside its February 11 meeting to hear Elmer G. Wallace, assistant supervisor of the D&H AAR Billing Bureau, discuss the many revisions to the 1955 rules. In making his presentation Mr. Wallace called attention to Section (h) of Rule 4 (and others) although these paragraphs do not come under the present changes. They are important, however, in terms of defect cards requested and money saved for the railroads.

The revisions to the 1955 rules follow.

Rule 2

Section (B), first paragraph—Modified to indicate that cars loaded with explosives and other dangerous articles must be handled in accordance with the I.C.C. Regulations and the United States Coast Guard Regulations when applicable.

New Section (E)—Added: "Cars not loaded in conformity with or failing to comply with provisions of applicable tariffs governing transportation by water carriers." Both of these changes were incorporated in Supplement No. 1—1954 Code.

Section (G) Paragraph No. 4—The 3 per cent for vacation expense to be applied to direct labor for the expense of transfer or adjustment of lading, when bills for same are rendered on the basis of actual cost, has been increased to 4 per cent. This paragraph also states the percentage to be added (separately) to this total to cover Railroad Retirement and Unemployment Compensation Taxes, and for overhead.

Rule 3

The effective dates of the following Sections have been extended to JANUARY 1, 1956:

Section (b-7)—Metal badge plates (brake levers).

Section (b-9)—Required braking power percentages.

Section (c-13)—maximum 1½-in. vertical clearance between top of coupler shank and under surface of striking face of striker casting.

Section (t-3-b)—Cast Steel Truck Side Frames having "I," "T" or "L" section compression or tension members. (Note following states no further extension will be granted.)

Section (b-8), Note 1 following—Modified to clarify the intent that "Replacement of defective or missing bottom rod and brake beam safety supports are to be in accordance with Section (m) of Rule 17."

Section (c-11), note following—Eliminated account no further extension granted beyond January 1, 1955 for this requirement that all cars equipped with former standard (except type D) or Temporary Standard Couplers having 5- x 7-in. shanks will be prohibited in interchange.

Section (r-5)—On June 2, 1954, the Secretary of the AAR Mechanical Division, issued a circular letter to the Members and the Private Car Owners calling attention to the condition of defect card receptacles and cardboard holders on freight cars, many of which are found missing, rusted out or otherwise defective. When system cars are on the repair track, this feature must be carefully checked and any necessary repairs made.

Section (s), new Paragraph (3)—Added to provide that automatic type slack adjusters applied to cars on and after January 1, 1956, must comply with AAR Standard Specifications and have Certificates of Approval.

Section (s), new Paragraph (8)—Added to provide that all car initials and numbers must be legible, from owners. When system cars are on repair tracks and such stenciling is found illegible, it should be renewed before car is released to service, likewise, illegible stenciling should be renewed on foreign and private line cars and charge rendered per Items 148, 149 or 147 of Rule 107.

Rule 4

Section (f-3)—Modified to provide that holes cut through metal side and end sheets of open top cars exceeding *two* inches (formerly *three* inches) measured in any direction are cardable in interchange. On cars equipped with AAR Standard or Alternate Standard lading tie down anchors, this limit is 1½ in. It is important that inspectors at interchange points make sure that all cars having such defects are properly covered by defect cards before they are accepted.

Section (h), Inspection of Tank Cars—Much closer inspections *must* be made at interchange points because of the continued request for defect cards by the tank car owners when cars are received in owners shops. Some of these damages involve dents in tank end heads, also side sheets and end heads of insulation jackets, which are costly items. Closer inspection should be made for loose and worn anchorage bolts and rivets, since if they shear off we become responsible under Section (3) of Rule 44, and often lading is lost if the bottom outlet casting becomes damaged by tank shifting on its underframe. The same necessary inspection applies also to cars of other types, particularly buckled center sills, etc., especially refrigerator cars and others having fishbelly type center sills.

Section (1)—There have been cases where foreign cars have been delivered to other roads with center sills buckled to the extent outlined in Rule 44, or other types of damage listed therein, and defect cards issued to cover. Defect cards should not be issued in such cases until investigation develops definite responsibility for such damage under the provisions of Rules 32 and 44, instead an Information Card should be attached to car and copy forwarded to the Billing Bureau for investigation and they will handle to conclusion.

Rule 7 and 8

Attention is again directed to the fact that a Billing Repair Card or record *must* be prepared covering every foreign and private line car that reaches shop tracks for any reason, even if only for examination, coupled to help switch a defective car, adjustment or transfer of lading, no bill repairs, etc.

Rule 9

Wheels and Axles R&R, eighth requirement—Eliminated which read "Purpose for which shopped, when wheels are condemned by any of the reduced demensions shown in Rules 71 and 75 (b-1) for cars on the repair tracks for other work." Billing repair cards being received indicate that shops are not removing wheels under these reduced dimensions when cars are on the repair track for other work. Closer inspection should be made to facilitate removal of these defective cast iron wheels from service and avoid accidents or subsequent shoppings when these shelled out or comby spots become longer.

Wheels and Axles R&R, last requirement—Added August 1, 1954, opposite this caption as follows: "If axles are rusted or pitted to the extent that reconditioning is necessary, billing repair card must specify 'No cutting or heating.' See new Interpretation No. 2 under Rule 84."

Care must be exercised in determining whether axle removed account rusted or pitted journal requires reconditioning account of *cut or overheated.* If not, the billing repair card must so state as outlined above to substantiate that the repairs are owner's defect.

Fourth sentence opposite "Journal Boxes Repacked, etc."—Changed to read 18 months to comply with Rule 66.

"General Heading"—Last sentence eliminated which read as follows: "The above information to be shown opposite each item, except where no bill is rendered." Billing repair cards covering wheels, truck sides, etc., as listed must show whether car is equipped with the approved packing retainer devices in "No Bill" as well as in "Bill Owner" cases.

Rule 16

Fourth paragraph—New sentence added as follows: "When new standards are applied at any location car *MUST* be stenciled indicating the *location* at which applied, for which a charge of ½ hour labor may be made, This stenciling to be shown *underneath* the new Standard Stenciling." For example, if a foreign or private line car is stenciled "NEW STANDARD 1-W WHEELS" and a pair of 1-W is applied in place of cast iron removed at location R&L 1, a figure "1" should be stenciled under the owners stenciling on each side or end of car, and should be shown on the billing repair card. If the R&L is already there, simply add the numeral.

Rule 17

Section (e), Note 6—States that "the majority class of beams under car, or if two beams are the heavier type, such majority class or heavier type will be considered as standard to car." Show this information on *record* repair card *only,* either front or back. Never substitute a lower beam for No. 18 beam since Note No. 9 hereunder, and Note 2 following price table for No. 18 beams on Page 220, provide a considerable penalty for such wrong substitutions.

Section (m), third paragraph—Modified to provide that when defective or missing bottom rod and brake beam safety supports, from which AAR. approval has been withdrawn, are renewed *in kind,* same continues as not chargeable but now defect card must be issued as outlined in Interpretation under Rule 19. Such defect card should be for labor only in cases of owners defects and for labor and material in cases of handling line responsibility. The most common type of brake beam safety support from which AAR approval has been withdrawn is the Universal cable type which has been superseded by the "G.N. Brake Beam Safety Support" (Conditionally Approved) which is Item 20 in the Approved List as shown on Page 239.

New Interpretation (A-4)—Added to provide that "substitution of old style angle cock, with or without supporting flange, in lieu of the new Wabcoseal angle cock (Pc. 549854 or N-7754) constitutes wrong repairs" and defect card should be issued for labor and material.

Rule 18

Section (E-1)—Modified August 1, 1954 to provide for the replacement of separate bottom rotary operation toggles (E-7) and lock lifters (E-8) of type "E" couplers preferably with E-24 articulated rotary lock lift riveted assembly complete, or with the riveted assembly E-14A, also, defective E-14A type should preferably be replaced with E-24 type and the E-24 type *must* be renewed in kind, which is now required in modified Rule 3-c-12 for cars built new or rebuilt on or after January 1, 1955. Item 134 of Rule 101 shows $2.50 as the charge for E-24, and Item 134 shows $1.70 charge for the E-14A.

Rule 19

Item 10—Modified to clarify the intent that journal bearings which do not conform to AAR Standard or Alternate Standard Specifications are prohibited in repairs to foreign cars, and subject to the penalty outlined in Interpretation under this Rule (same Interpretation as for safety supports Page 66).

Rule 25

Modified to provide that it is necessary to hold and report to owner such worn or corroded truck side frames removed under the requirements of this Rule, only if cast subsequent to 1926. Defective truck side frames cast in 1926 and prior thereto may be scrapped when removed.

New Rule 27

Added as follows—"Geared hand brakes on cars must be given periodic attention as outlined in Paragraphs 3-7, inclusive, of Specifications for General Repairs and Reclamation of Geared Hand Brakes shown on Pages E-95 and E-96 of the Manual of Standard and Recommended Practice on all cars receiving Class 1 general repairs or rebuilt as defined in Rule 112." These Specifications require complete dismantling of Geared Hand Brakes for repairs and testing after repairs are made.

Rule 33

Interpretation (2)—Modified to clarify the intent that responsibility of car owner for damaged safety appliances only (on other than tank cars) includes both *metal* and wood running boards and brake steps.

Rule 58

Modified to include the release control retainer valve (with or without bracket and strainer) as material for which the delivering company is responsible when missing.

Rule 61

New Paragraph (a-1)—Added to provide that "When cars are in general or class repair shop for overhauling or reconditioning, trucks must be removed and dismantled to the extent necessary for complete inspection and all defective parts repaired or renewed."

Paragraph (c)—Modified to clarify the intent that when car is on repair track and is jacked for *any reason, irrespective of responsibility,* the center plate must be lubricated, for which charge may be made versus car owner per Item 172 of Rule 101.

Rule 62

New First Note—Added to provide that when second-hand air hose are applied to freight cars (without charge), they must be tested as specified in Section (j-3) of P.C. Rule 7.

Rule 66

Paragraph (b)—Modified to indicate that the requirements of this Paragraph regarding periodic repacking of journal boxes are mandatory (by substituting the word *must* for *shall,* and the new last sentence added prohibiting the use of *WOODEN* dust guard plugs.

Section (j), former Item 6—Eliminated, as former Item 7 (now Item 6) provides that journal bearings must be renewed "when wheels and axles are changed." The Item 6 eliminated read: "When contour of brass is not suitable for the size of journal on axle applied."

Rule 66-A

New note following Section (L)—Added to read "Journal roller bearings on freight cars should preferably be all grease lubricated or all oil lubricated."

Rule 70

Section (a), Item 14—Modified to provide that cast iron wheels substituted for AAR X-2 or AAR X-3 cast steel wheels are wrong repairs as outlined in Paragraph (c-7) of Rule 98.

Section (b)—Modified to provide that M.W. or 1-W wrot steel wheels may be substituted for cast iron wheels under 70-ton covered hopper cars and the betterment charge made against car owner regardless of responsibility for the repair.

Rule 82

Paragraphs (b-2) and (b-4)—Remount limits—wording changed to clarify the intent. (b-2) changed to read "four or more" instead of "more than three" brake burn cracks and (b-4) changed to read "three or more" instead of "more than two" comby spots, on cast iron wheels.

Rule 84

New second paragraph—Added to provide that "when Alternate Standard Tubular Axle has been overheated in service to an extent where it is necessary to remove the pair of wheels involved from the car, such axle must not be reconditioned but must be scrapped at the handling line's expense."

Interpretation No. 2—Added August 1, 1954, to clarify the intent that rusted or pitted journals are owners responsibility unless the journals require reconditioning account of cut, overheated, or car was involved in flood damage. See remarks under Rule 9 regarding information which *must* be shown on billing repair cards in such cases of owners responsibility. This condition must be guarded against on stored cars, and when removing cars from storage.

New Interpretation No. 3—Added to clarify the intent that delivering line is responsible for journal boxes or truck side frames damaged in connection with cut journals or broken, due to heating.

Rule 98

Interpretation (4), note following heading "In Case of Delivering Lines Defects"—Modified by eliminating the phrase "no charge for turning" at end of both paragraphs. as charges and credits for 1-W wheels do not include any charge for turning.

Rule 101

In addition to prices changed in Supplement No. 1 to the 1954 Code, additional price modifications have been made on a number of items as a result of subsequent quotations (New Items Listed).

Item 2, new Note—Added to provide charge on basis of Rule 105 (actual cost) for the new Wabcoseal angle cock (Pc. 540854 or N-7754) only when renewed *in kind.* Billing repair card must show type removed and type applied to justify such charge. This new type or converted type should not be substituted for the old type on foreign cars since betterment charge is not permitted in such cases.

Item 100—Wabcogrip or Flexigrip fittings

Item 101-B—Wabcoseal offset elbow fittings, R or L

Same note added to each item stating, "Component parts applied separately shall be charged at Stores Department cost (Rule 105).

Rules 101, 107, 111

Material Charges (Rule 101), Labor Charges (Rule 107), Air Brake Repairs (Rule 111)—All combinations items (those including labor and material) adjusted to include the $.05 per hour increase in labor rates effective January 1, 1955, and any changes in prices of material.

Rule 111

Item 10—Modified to clarify the intent that the arbitrary $.71 allowance for the cleaning and testing a retainer valve or release control retainer, on or off car, does not apply to defective valves as outlined in Item 1 of this rule. In the latter event charge and credit are on basis of renewing the valve per Rule 101 prices.

Rule 112

Settlement for Destroyed and Badly Damaged Freight Cars, Section B, Paragraph 5—Modified to indicate that iceless refrigerator cars referred to, mean the mechanical type, and that basis for settlement on reproduction cost is outlined in Paragraph 3 of this Section B.

Section B, Paragraph 9, new Note 3—Added to provide for reproduction cost basis of settlement for tank car heater coils made of metals other than ordinary steel pipe, provided tank is stenciled showing kind of coils. When reporting any such tank cars for disposition ac-

count badly damaged or destroyed, report should show how car is stenciled for kind of heater coils, such as brass, copper, nickel, stainless steel, etc.

Section B, Paragraph (10-c)—Modified to provide for increased additional allowance in settlement for destroyed cars equipped with type AB brakes, wrot steel wheels, auto loading devices, air circulating fans and high tensile steels.

PASSENGER CAR RULES

Rule 2

The effective dates of the following Sections have been extended to JANUARY 1, 1956:

Section (e)—Cardboards or suitable receptacles for defect cards and joint evidence cards.

Section (f)—Brake shoe spark shields over wheels.

Section (j)—Pitt type couplers.

Section (k)—AAR Standard Type "H" couplers.

Section (l)—AAR Standard Type "H" couplers, or Type "F" interlocking coupler, on Class "B" cars.

Section (h)—Modified due to manufacture of Alternate Standard Tubular Axle having been discontinued.

Rule 7

Section (e)—Modified to indicate that "In machining wheels and axles, and mounting of same, the current AAR Standard Wheel Shop Practices (Section XX of the Wheel and Axle Manual) *must* be followed."

Section (f-13), Note 2—Modified to provide that where untreated 36-in. M W—WS wheels are substituted for heat treated wheels, same shall be charged at 50% value instead of at scrap value as heretofore. The type and class of wheels removed and applied must be shown on billing repair cards to determine proper charges and credits.

Section (j-3), note—Modified by adding reference to an additional air brake instruction pamphlet, "No. 5039-2, the No. 3—U S B Test Rack—Code of Tests, U-12 Type Universal Valves 7-1950."

Section (l-1), new first Note B—Added to provide that requirements for the packing retainer devices shall be as provided in Interpretation No. 4 to Rule 66 of the Freight Car Code.

New second note—Added as follows: "Note—Journal roller bearings on passenger cars should preferably be all grease lubricated or all oil lubricated. Where car is found having both grease lubricated and oil lubricated journal roller bearings, all boxes must be checked and lubricated on the 30 day time limit basis."

Rule 8

Section (e), new second Paragraph—Added to provide for scrapping, at handling line's expense, Alternate Standard Tubular Axles removed account being overheated in service. Such axles must not be reconditioned.

Rule 13

Section (a), second item—Modified to provide that labor charge is now permissible where it is found necessary to R&R slack adjuster to unlock same. Show actual time for same on billing repair cards. Also see Item 20-K of P.C. Rule 21.

Fifteenth item (Gas domes, bulbs, globes, bowls, pillars or tips, applied)—Eliminated account no longer used in cars operating in interchange service.

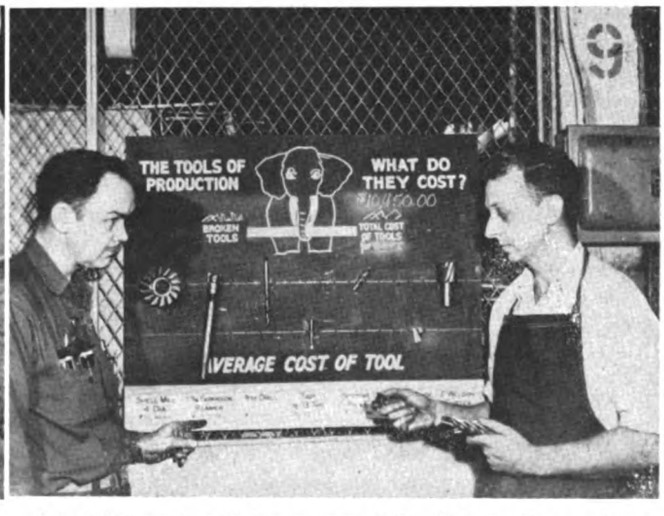
Rule 21

Items 2 and 2-A—Modified to indicate that these labor charges cover electric light shades as well as bulbs or tubes.

Rules 21 and 22

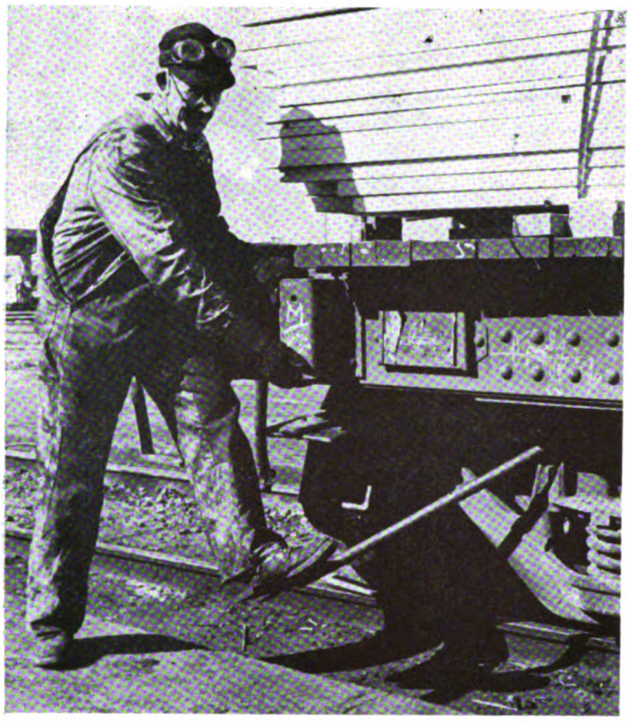
Labor Charges (Rule 21), Material Charges (Rule 22)—All combination items (those including labor and material) are adjusted to include the $.05 per hour increase in labor rates effective January 1, 1955, and any change in prices of materials.

Note 2, Page 370—Modified to provide that "where repairing line is required to turn a 6 x 11-in. axle to 5½ x 11-in. axle to make repairs standard to car, such axle applied shall be charged at secondhand value, per Item 199 of Freight Rule 101." Otherwise, they shall be charged and credited at scrap value per same item.

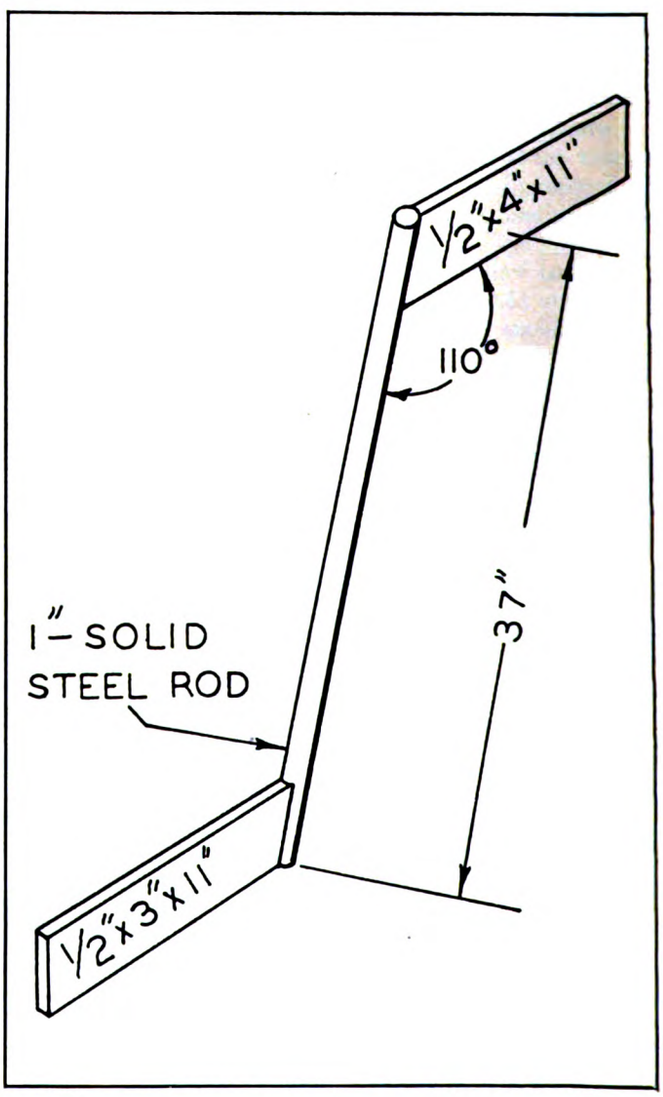


A 20% REDUCTION in tool breakage has resulted from "price-tagging" all production equipment (left) and tools (right), at the Clark Equipment Company's Industrial Truck Division. The Company found that workers had more respect for their machines and tools when they realized that a machine cost $22,000, or that reamers cost as much as $18.75 each.

Ideas for the Car Repair Man...



Dismantling Ride Control trucks on a rip track is easy with an offset lever that compresses the friction wedges by standing on the free end (actually the truck must first be rolled out from under the car). Details of the lever are shown below.



SIMPLE BAR COMPRESSES RIDE CONTROL SPRINGS.—A comparatively short, easily made and easily handled offset lever takes the place of a long bar for compressing the friction wedges preparatory to dismantling ASF Ride Control on a western road.

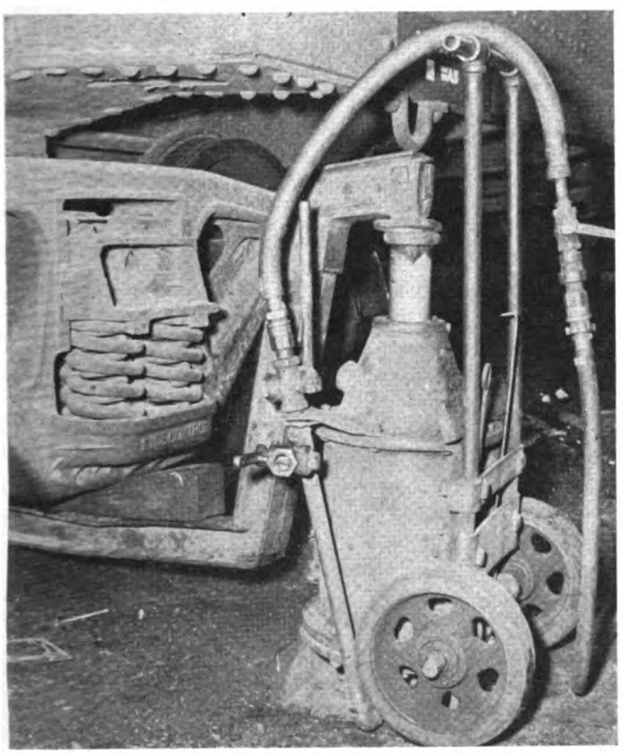
The lever is a 37-in. length of solid steel rod on either end of which a steel plate is welded as shown in the drawing. The plates are welded at an angle of about 20 deg off the true perpendicular to the rod. One plate is ½ in. by 4 in. by 11 in., the other ½ in. by 3 in. by 11 in.

The truck must be rolled out from under the car before the lever can be used to remove the weight and to lessen the distance between the friction snubber and the top of the side frame. With the weight of the car off the truck, the plate on one end of the lever is inserted between the top of the friction wedge and the under side of the top of the truck side frame. Standing on the second plate twists the first plate to compress the wedge and move the friction block eye into position for securing with a pin for wheel change or other truck work required.

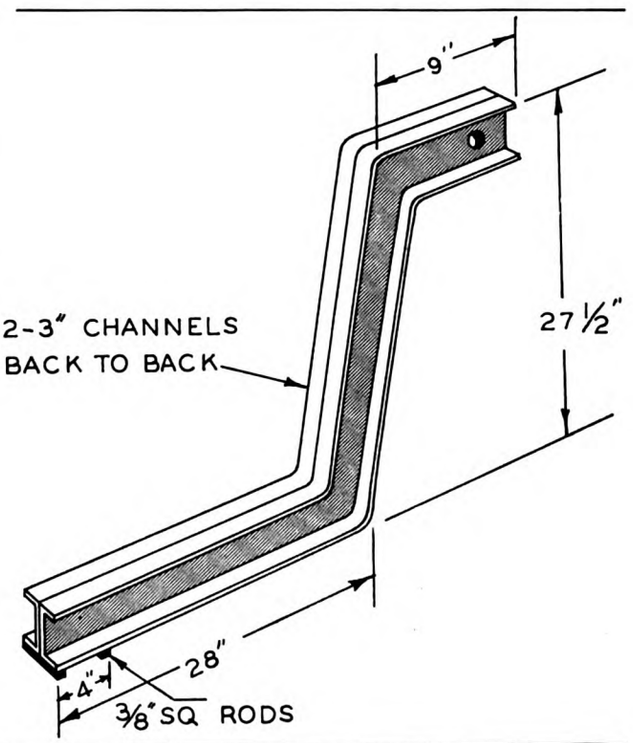
The plates are some 20 deg off the true perpendicular to enable the free end of the lever to clear the journal box when the man stands on it and lowers it. The two plates are different widths (3 in. and 4 in.) to adjust for the variations between trucks in the distance from the top of the side frame to the top of the wedge; for example, if this gap is large and the 3-in. end were inserted, the free end would, when stepped on, touch the ground before the wedge was compressed. Therefore, the end with the 4-in. plate would be used.

Boxes on both ends of one side of a truck can be worked with only one jacking of the side frame.

Combining a lifting lever with an old brake cylinder mounted on wheels forms a handy side frame jack.



A wedge is used between the lever and the bottom of the side frame to take up the free space

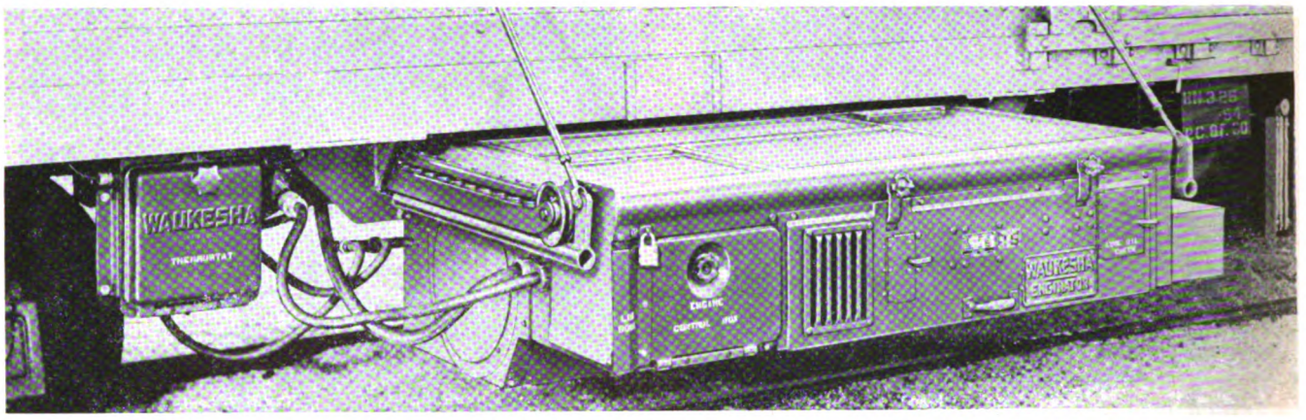


SIDE FRAME JACK FOR RIP TRACK USE.—The brasses and wedges from both boxes on one side of a freight car truck can be changed out with but one jacking of the side frame by a method developed by the Wabash for use on the rip track at Decatur, Ill.

The jack is made from an old 10-in. brake cylinder, to the top of the shaft of which is pinned an L-shaped lifting lever. Along the bottom of the lever two ⅜-in. square steel bars are welded. The end of the bar rests on the rail with one of these rods on either side to hold it in position. Admitting air to the cylinder raises the lever, with the end on the rail serving as a fulcrum to lift the side frame for renewing the brasses or wedges.

A wedge is inserted between the lever arm and the bottom of the side frame to take up part of the gap and to give a straighter lift. Small boards are also inserted between the truck side and the wheel hub. They prevent the box from going against the hub of the wheel which would otherwise occur as the side frame is tilted while it is being lifted. The purpose in preventing this contact is that it makes it difficult—and sometimes impossible—to put the wedge back in.

The jack and lever have a capacity for lifting empty 70-ton cars. The lever is made of two 3-in. channels welded back to back.



The 20-kw Diesel Enginator shown in rolled-out servicing position on tubular track extensions which are part of the mounting track assembly. At left is the weatherproof housing of the automatic thermostat control panel, which also contains the manual control for presetting car temperature.

Mechanical Refrigeration and Heating for Reefers

The Waukesha Motor Company has developed equipment for application to old or new cars which provides refrigeration or freezing and heating and ventilation service

■ Complete equipment for keeping temperatures in refrigerator cars in the 20 to 70, or the −10 to +5-deg F range, or to supply heating or ventilating service is now being made by the Waukesha Motor Company, Waukesha, Wis. The equipment may be used for new cars or for converting existing cars to mechanical refrigeration without structural change. As applied to cars designed for ice cooling, existing ice bunkers are removed and the system provides for loading the entire inside cubic capacity of the car, a gain of about 10 per cent in a 50-ft car. Packaged units allow easy removal for exchange or servicing.

The system for low temperature cars, required by the frozen food industry, consists of two completely packaged cooling and heating units which are installed in icing hatches, one at either end of the car, and a diesel engine-generator unit mounted under the car. For cars used exclusively for transportation of non-frozen products at temperatures of 30 deg F and higher, only one cooling and heating unit is required.

The installation of the power unit consists only of locating two mounting tracks on the underframe of the car. The Enginator unit is rolled into position on these mounting tracks which are equipped with extension rails which permit the rolling out of the unit for normal servicing and maintenance. A power conduit is installed from the power unit along the underframe of the car, up the end of the car and along the top of the car adjacent to the running board. This supplies the electric energy which operates the motor-driven cooling and heating units which are mounted at the top of the car.

To install the heating and cooling units which are completely packaged and freon-charged at the factory, the hatch cover or plug is removed and the cooling and heating unit is installed in the icing hatch frame. The cooling and heating unit is designed to fit into standard hatch frames and is equipped with an adapter plate to meet any variation in the frames.

The evaporator and air circulating fan extends down into the car. The electrically driven compressor and condenser projects above the hatch opening and working parts are accessible from the car roof. A heavy insulation barrier is located between the evaporator section and the condenser section of the cooling and heating unit.

The diesel fuel system usually consists of two, 200-gal diesel fuel tanks which are located on the underframe of the car. A battery box is also located on the underframe. An automatic temperature control panel is also located adjacent to the Enginator. Top and bottom inside

car temperature indicators are conveniently located on the side wall of the car. The system is also available for new car building programs in either top or side mounted units.

The Enginator

The Enginator consists of a 6-cylinder, 4-cycle diesel engine, directly connected to a 20-kw, 220-volt, 3-phase, 60-cycle fully-enclosed alternator which is interior-cooled by engine intake air and exterior-cooled by the radiator motor fan. The diesel engine is water-cooled by a large radiator with motor driven fans. The engine is rated 42 hp at 1,200 rpm.

The crankshaft is counterbalanced. Valves are Stellite-faced seating in Stellite inserts. Cylinders are renewable, hardened and wet-sleeve type. The fuel injection system consists of a seperate injection pump with pintle-type injectors. The lubrication system is full pressure to all main, rod and piston pin bearings, rocker arms and timing gears. The oil capacity is 22 quarts.

The engine is started by a 24-volt electric system. Sub-zero starting is accomplished with the aid of a 110-volt electric heating element, built into the engine coolant system and operated from standby electric service. Also included is the Chevron capsule-type primer. The Enginator is equipped with protective devices such as automatic shut-down controls guarding against engine overheating and lubrication failure. It is started and stopped manually since it operates continuously when the car is in revenue service. The unit, which is rated 20 kw weighs 2,100 lb.

Automatic Cooling and Heating Unit

The condensing section of the cooling and heating unit consists of a 3-cylinder, valve-in-head reciprocating type, air and refrigerant-cooled, hermetic type compressor operated by a 6-hp, 220-volt, 3-phase, 60-cycle motor at 1,750 rpm. The condenser is the high capacity, finned-tube type, air-cooled by dual integral ¾ hp motor fans. The refrigerant receiver is of fabricated steel and is located within the condensing section of the cooling and heating unit.

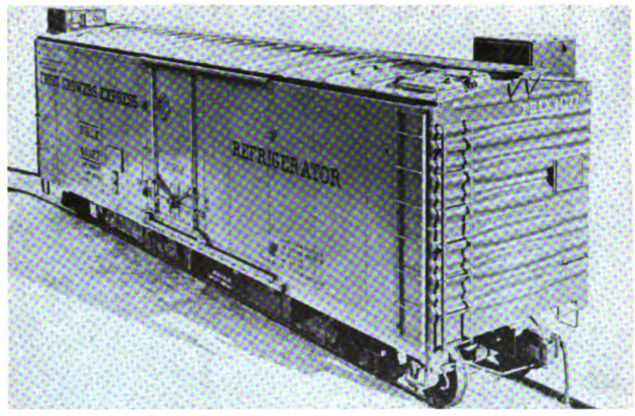
The evaporator section of the cooling and heating unit is separated from the condensing section by a heavy insulation barrier. The evaporator is of the finned-tube, multi-pass, counter flow type, employing a ¾ hp integral motor fan. The electric heater section is located between the evaporator and the motor-driven fan and is of 4 kw capacity and thermo-statically controlled. Defrosting is accomplished by fully automatic, electrically controlled hot gas.

The unit chassis is of fabricated high-strength alloy steel. The evaporator section is galvanize dipped. The unit capacity at 90 deg F ambient, with a car temperature of 0 deg F is 18,000 Btu per hour. Two units being used in low temperature cars provide a capacity of 36,000 Btu per hour. The total weight of the cooling and heating unit is 1,150 lb.

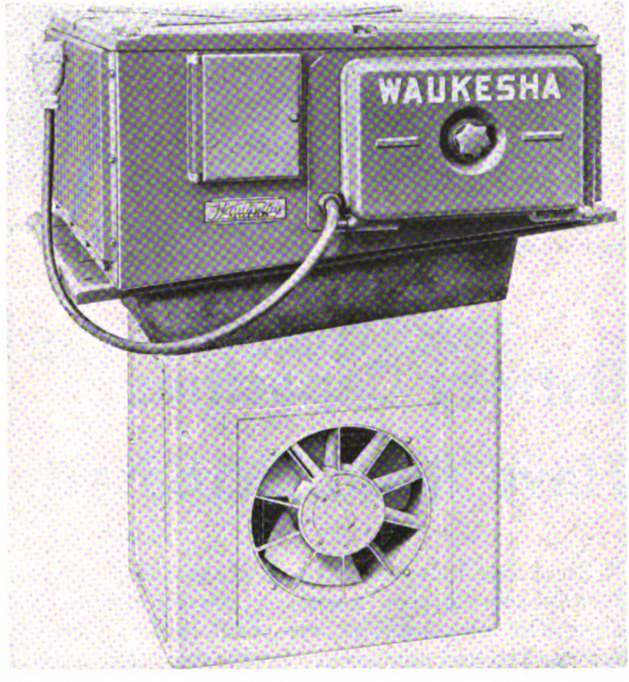
The control of the cooling and heating units is electric and fully automatic. This equipment is housed in a weatherproof accessible control box located on a side panel of the condensing unit. All motors and electric car heater are thermal-overload protected.

The thermostat of the system is of the electronic type. It is housed in a readily accessible control box conveniently located beneath the car underframe adjacent to the engine generator. It is equipped with a temperature dial divided into two ranges; an upper range from 20 deg to 70 deg F, and a lower range from —10 deg to +5 deg F. The cooling and heating units operate automatically and cycle on and off on demand. Cooling and heating is provided for automatically in the upper range for 20 deg to 70 deg F. The control system provides for cooling only in the lower range from –10 deg to +5 deg F. The system was designed to meet the operating conditions encountered in freight service and is not affected by changes in altitude and ambient temperatures.

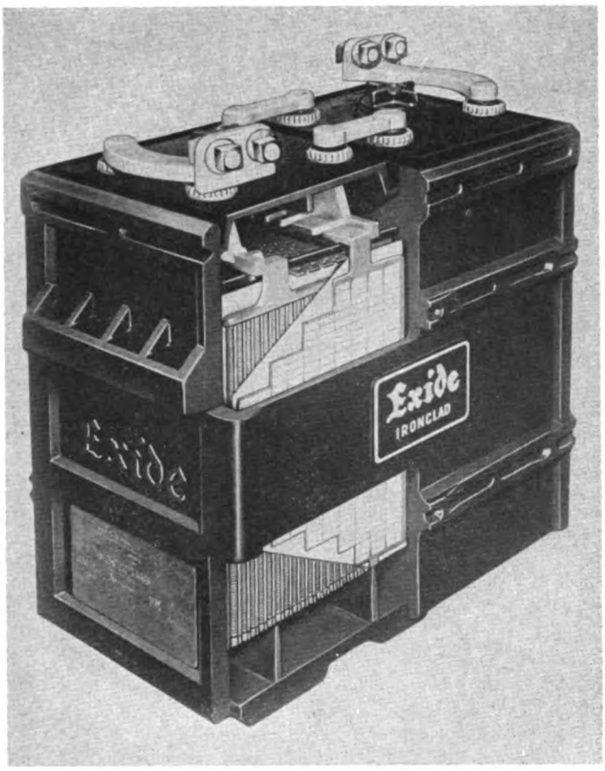
All installations are equipped with an electrical receptacle to permit the operation of the electrical condensing units from standby electric power.



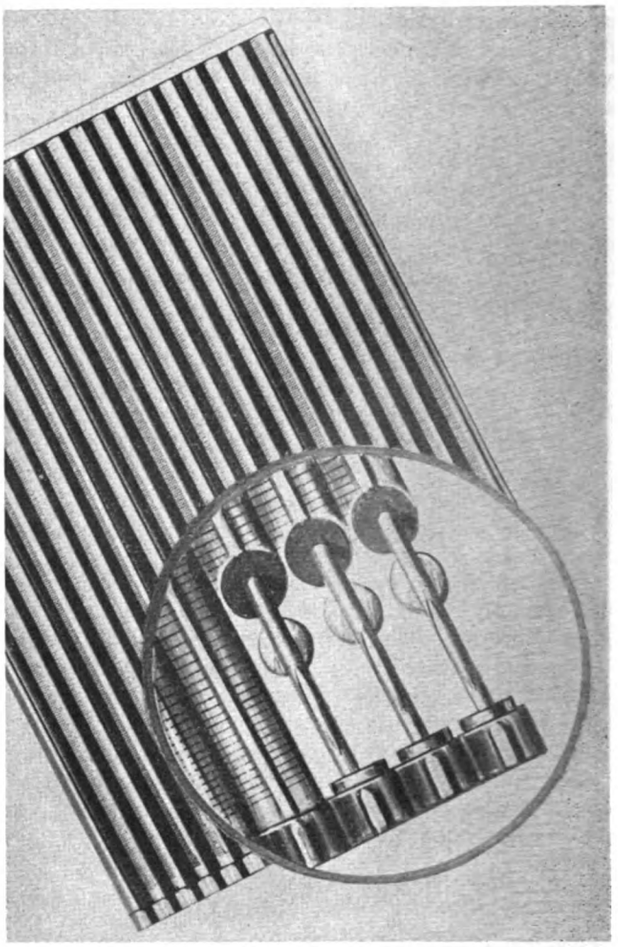
A standard water-ice refrigerator car converted to mechanical refrigeration with the Waukesha "Diesel-Icer" system. A cooling-heating unit is shown installed in the ice-bunker hatches at each end of the car. The remaining hatches, shown closed, may be opened for ventilation cooling, if desired. Mounted under the car in operating position is the 20-kw Diesel Enginator.



Diesel-Icer system cooling-heating unit;—the upper condenser section which extends above car roof, contains the dual condenser fans, the motor compressor, condenser, and the refrigerant receiver. The galvanized-dipped lower evaporator section, which extends into the ice bunker, contains the evaporator, integral motor-fan, and thermostat-controlled electric heating unit.



A two-cell Type EH battery with a section of the container cut away to show internal construction.



A positive plate with magnified section showing how active material is packed into slotted plastic tubes around each grid spine.

Battery Capacities Have Been Increased

■ The Exide Industrial Division of the Electric Storage Battery Company has announced new car lighting and air conditioning batteries, type EH, which will deliver full rated power initially and throughout a longer working life than similar batteries made previously by this company.

The capacity increase is obtained by an increased length of plate. This is made possible by the performance of the Ironclad type positive plate. Long service showed that sediment deposits were so small, that in the same sized containers, there was room for plates of greater length.

The positive plates have been balanced with new "stable-voltage" negative plates to insure the delivery of full capacity throughout the life of the battery.

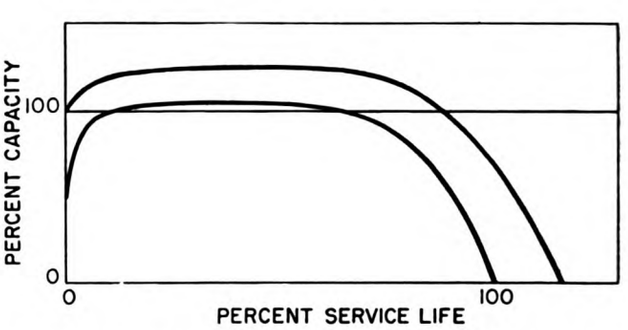
New Alloy Grids

Grids of the EH batteries are cast of an alloy called Silvium, a silver-lead alloy, developed by Exide engineers. The manufacturer states that by cutting down wear of the positive grid spines, the use of Silvium reduces power loss and charging time and also adds to the life of the battery.

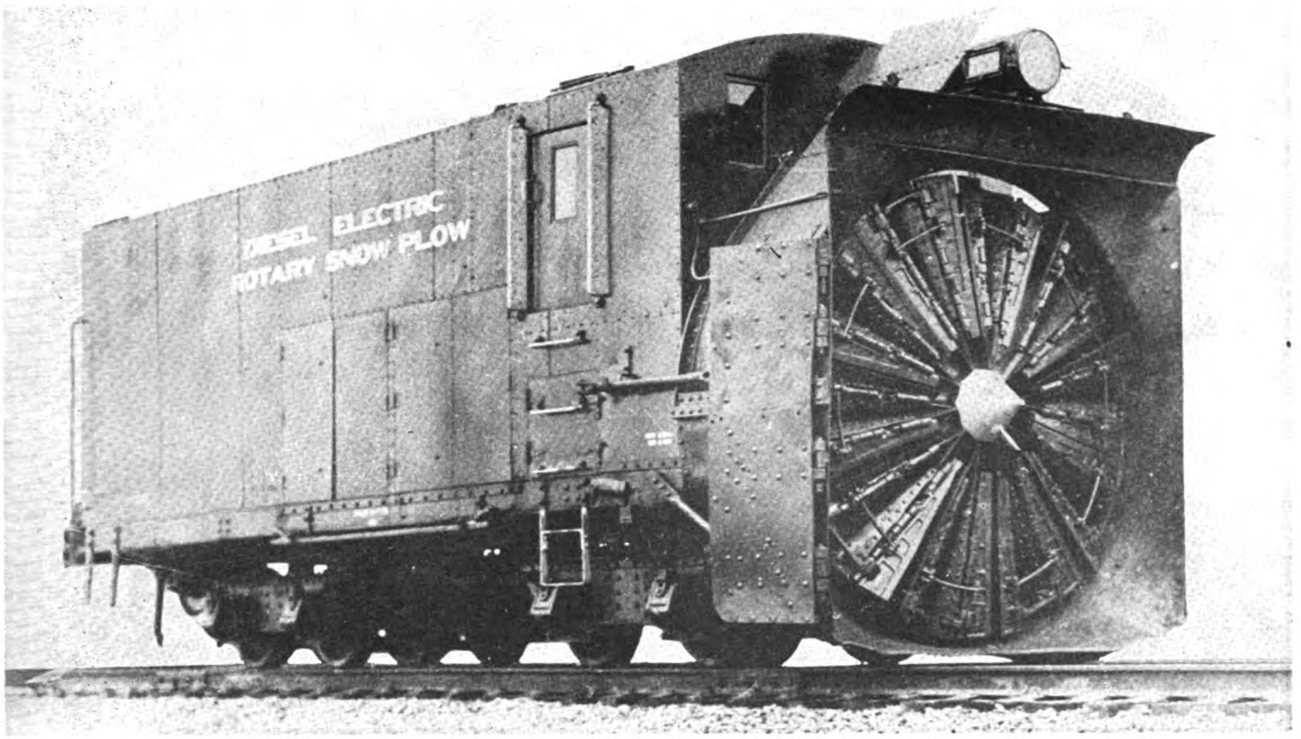
Finely slotted, acid-proof polyethylene tubes retain the active material in contact with the grid spines and permit it to be freely penetrated by the electrolyte. Tube sealers of the same material are attached to the bottom of the tubes, firmly sealing the active material. This prevents short circuits and lengthens service life.

The containers are made of a tough, durable hard rubber and have been designed with extra thickness for protection at points of greatest strain. End and side walls are ribbed to withstand shock and vibration encountered in railway service.

The batteries are available in two-, three-, and four-cell trays in capacities ranging from 268 to 1,320 amp-hr.



Upper curve shows relation of Type EH performance to battery rating.



Conventional rotary snowplow fitted with electric drive.

Electric Drive for Rotary Snowplows

By A. H. Hoffer and
R. E. Willhite

Big power under almost completely automatic control provides means for rapid snow removal

■ As complete dieselization of the United States railroads approaches, the problem of replacing steam-power rotary snowplows increases. Numerous designs have been tried in the past decade, but thus far none has satisfactorily met all of the broad requirements. The electric drive here described features high reliability, overall simplicity, standard interchangeable components, inherent stabilization, and adaptability.

Power Requirements

The power required to drive a snowplow rotor depends upon (1) the weight of the snow to be removed per unit of time, (2) the net energy imparted to the snow, and (3) the overall electrical and mechanical efficiencies of the plow.

A study of the fundamental principles of the rotary snowplows shows that the power required by the rotor varies as the rate by which the cut is advanced. The available power must be divided between advancing the cut and casting the snow. In practice the relationship between these two varies greatly, so the ideal drive should permit utilizing the full output of the power plant over a wide range of rotor speeds.

Messrs. Hoffer and Willhite are both with the Locomotive & Car Equipment Department, General Electric Company, Erie, Pa.

The power required to drive a snowplow also depends upon the length of the line to be cleared in a given time, and the rate at which the line is being covered with snow. A rate of snow fall averaging one inch per hour is considered quite heavy, but rates up to four inches per hour have been recorded in mountain areas. Rate of fall, however, is not always the prime consideration. Depending on wind conditions and nature of the terrain, drifting of even a light snow can block a line more seriously than a high rate of fall.

Power requirements also depend directly upon the snow density. This varies widely with many factors, such as structure of the snow, the prevailing temperatures and wind conditions, and the time of settling. The structure may vary all the way from a light crystalline fluff to a heavy, lumpy, wind-packed, water-soaked encrustation. The rotor must be able to shear and discharge all types equally well. Fresh snow weighs between three and seven lb per cu ft, and wet snow, packed by slides and avalanches has been known to weigh as much as 50 lb per cu ft.

Besides possessing sufficient power, a good electric snowplow must fulfill the following generally accepted requirements:

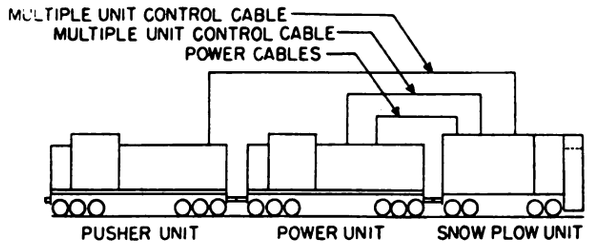


Fig. 1—Head-end of snowplow train showing cables between units.

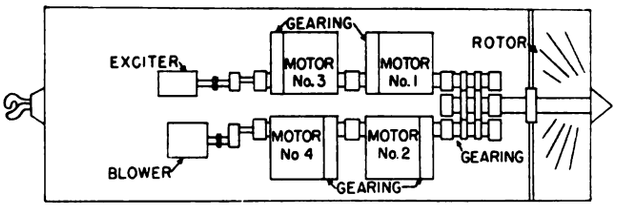


Fig. 2—Schematic arrangement of equipment in snowplow unit.

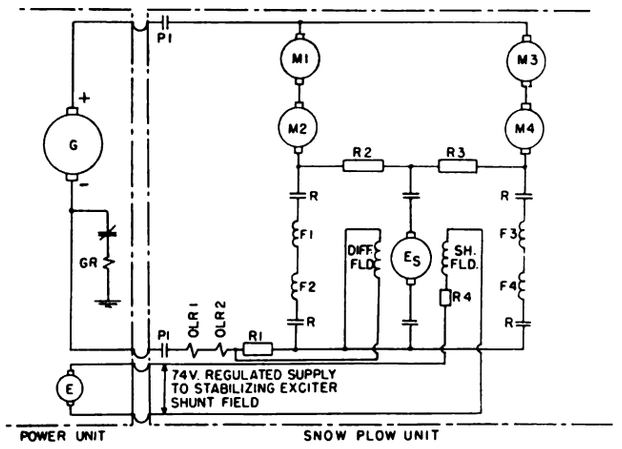


Fig. 3—Schematic diagram of circuits for electric snowplow drive.

1. It must be sturdy, simple and reliable, both electrically and mechanically.

2. It should be readily adaptable to any standard diesel-electric road locomotive unit.

3. Its use should require no alterations of the equipment in the power unit.

4. It should be made up of standard interchangeable locomotive components.

5. It should be inherently self-protective against overloads and overspeeds.

6. It should be able to operate gently and smoothly, with no sudden changes of torque or speed, over its entire speed range.

7. It should be able to adjust itself to meet sudden fluctuations in load.

8. It should be able to load the engine of the power unit to its rated capacity over a wide range of rotor speeds.

9. It should be able to operate equally well in either direction of rotation.

10. The operator should be able to control both the power and the pusher units remotely (multiple-unit operation).

11. The plow unit should be able to withstand the rotor reaction torque and have good tracking ability.

A thorough study led to a simple design which satisfactorily meets all of the generally accepted requirements. A stabilizing exciter causes plow drive motors to deliver the desired speed-torque characteristics at all times. The manner in which this exciter operates is the novel feature of the drive. By automatically regulating the strength of the drive motor fields it controls the speed of the rotor for any load. The operator only has to see that the plow is moving forward at a speed which results in the snow being cast no farther than is required.

The head end of the snow plow train—including the plow, power unit, the pusher unit, and the electric connections between them—is sketched in Fig. 1. The layout in Fig. 2 shows the rotor, gearing, drive motors, stabilizing exciter, and traction motor blower. The basic wiring diagram of the drive is shown in Fig. 3. Motors 1, 2, 3, and 4 are standard GE-731 series traction motors with standard gearing. Although four motors are shown, the basic system will work equally well with fewer larger motors capable of handling the rated output of the power plant. Stabilizing exciter, *A1*, is a GE-1185-M1 auxiliary d-c generator, rated 25 kw at 37½ volts.

The output of this exciter depends upon its speed and its net excitation. The speed is directly proportional to the speed of the rotor, making the exciter immediately speed sensitive. Its net excitation is the resultant of the shunt and differential field excitation. The shunt field excitation is constant (fixed by the setting of *R4*) and determines the no-load speed of the rotor. The differential field excitation (which varies directly with load current through *R1*) determines the speed of the rotor when under load. By simply adjusting *R1* and *R4*, the speed torque characteristics of the plow drive can be made to match the volt-ampere characteristics of any standard power unit. Once these adjustments have been made, the operation of the drive becomes completely automatic.

A standard reverser, *R*, allows the drive to operate in either direction of rotation.

Operation

The plow may be equipped to provide complete control of the speed and direction of the snowplow train from the plow cab by means of multiple-unit connections, or these functions may remain in the pusher unit as in the past. The power input to the rotor and its direction of rotation are regulated by the controller, similar to that found on locomotive B units.

After the motor circuits of the power unit have been separated from the generator the extension power leads to the snowplow motors are connected in their places. Additional auxiliary power for the plow is furnished by connecting extension leads to the auxiliary power system of the power unit.

Once the snowplow train has been made up with the necessary power, auxiliary and control connections, it may be moved to the sight of operations. Track conditions ahead can best be observed when operating from the snowplow cab, and the forward speed of the plow varied to maintain full load while casting snow the required distance.

To bring the rotor up to maximum speed, the snowplow operator notches his control all the way out. As the train moves forward into the snow, the rotor speed drops slightly until the plow has loaded the power unit engine

to its rated output. Any further demand for increased rotor torque results in a reduction of rotor speed. Although this reduces the distance the snow is cast, the output of the power unit engine remains at a maximum. Therefore, the distance the snow is cast can be controlled by varying the forward speed of the train. Hence, the snowplow drive utilizes the maximum output of the power unit engine over an extremely wide range of rotor speeds.

All other conditions being constant, the rotor speed decreases as the forward speed increases. As the rotor speed approaches one-half of its rated value, the rotor has difficulty in clearing itself and is in danger of stalling. (Stalling occurs when the snow is no longer moving fast enough to clear the chutes.) As the rotor speed decreases, the line current increases. Therefore, stalling is prevented by setting *OLR-1* to trip at the proper value of generator current. This removes the field of the pusher unit generator, returns its engine to idle, thus stopping the forward motion of the train and giving the plow a chance to clear itself.

If for any reason, the torque demanded by the rotor should exceed the safe maximum of the drive, *OLR-2* operates. This removes the field of the power unit generator and returns its engine to idle. After a moments delay, power contactors open, removing all power from the drive. The train may then be backed up and inspection made for hidden obstructions.

This drive has inherent speed regulation. However, in case a component failure causes the rotor to overspeed, the mechanical overspeed switch will operate. This removes the field from the power unit generator and returns its engine to idle. After a moment's delay, the power contactors are opened and all power is removed from the drive.

The plow must be able to track well even under maximum rotor reaction torque. During normal operation the reaction torque of the plow here described never exceeds 15 per cent of the safe limiting value for good tracking. In the event of the rotor striking a hidden obstruction, the instantaneous speed torque would be considerably greater than this 15 per cent, and would undoubtedly shear the pins provided to protect the drive.

The drive here described makes more power available to the rotor over a broader speed range than any other drive now known. It features low initial and maintenance costs, high reliability, overall simplicity, standard interchangeable components, inherent stabiliation, and extreme adaptability.

Experience obtained thus far indicates that this type of plow should be a great aid in removing the headaches of winter railroading in mountainous areas.

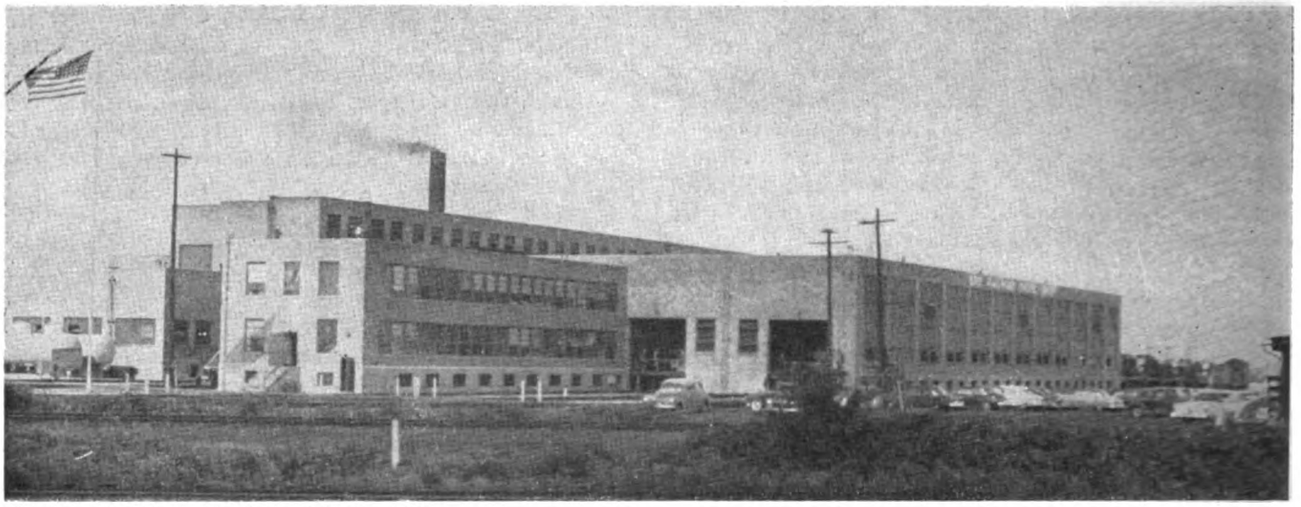
New GE Diesel Being Tested

■ A new four-unit, 6,000-hp diesel-electric road locomotive has been produced by the General Electric Company and placed in operation on the Erie for the announced purpose of evaluating components used in locomotives for export service.

Running normal freight schedules, its operation over an extended period will simulate as many export-type applications as possible. To achieve this end, two of the four units are powered by eight-cylinder, V-type Cooper-Bessemer turbo-supercharged engines. These four-cycle units develop 1,200 hp each for traction at 1,000 rpm. The other two units are powered by 12-cylinder engines of the same make that develop 1,800-hp each. The four units have a total weight of 490 tons and an overall length of 212 ft.

All units are equipped with GE-752 standard heavy-duty diesel-electric locomotive traction motors to permit testing under heavy American railroad operating conditions. Provision is made for full dynamic braking. Static excitation and the latest GE design control components are employed.

The units were built by General Electric to provide a means of accurately observing the performance of various standard components and of testing new standard devices in actual operation, with the aim of further improvement in design and performance.



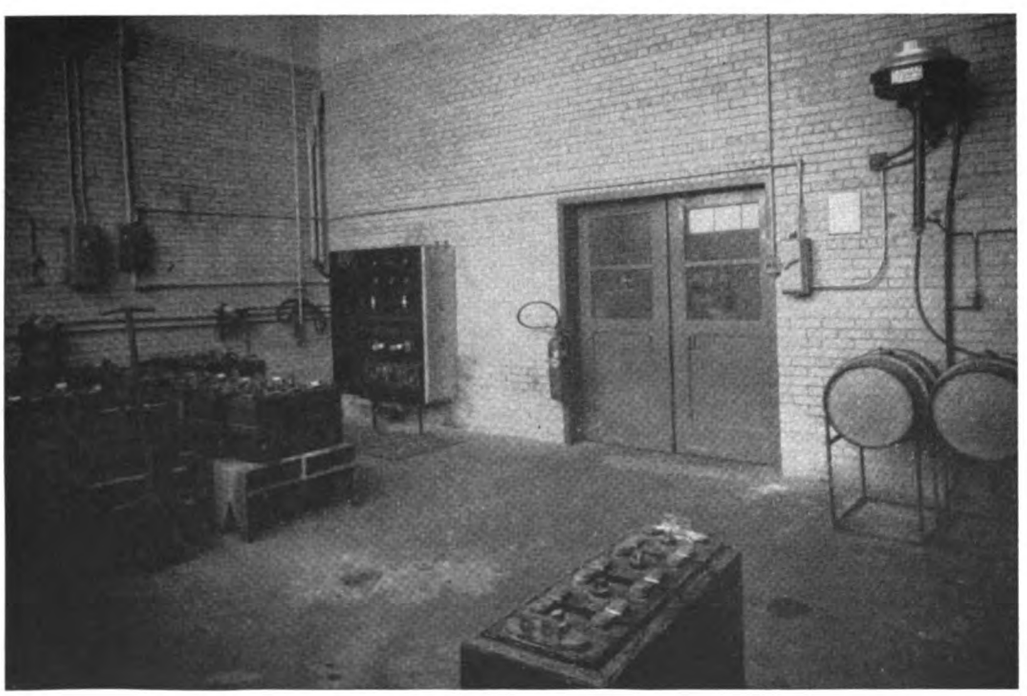
The Erie diesel locomotive shops at Marion, Ohio.

Erie Installs Battery Shop at Marion

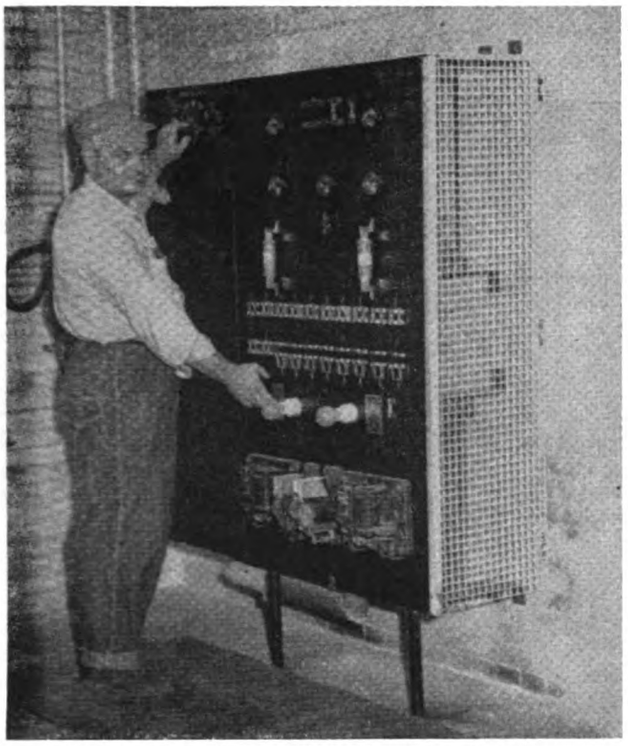
■ To serve the needs of its diesel-electric locomotive batteries at its Marion, Ohio shops, the Erie has equipped the battery room, shown in one of the illustrations. The equipment includes means for charging and discharging batteries to condition them, and determine their capacity, and for making repairs to connectors, replacing covers or trays, renewing seals, cleaning, etc. The Stokes still shown at the right in the picture of the shop interior supplies three gallons of distilled water per hour which is stored in the two barrels.

Charging current is supplied by a General Electric welding set. It is mounted on a bracket on the wall, outside the battery shop, to have the generator away from acid fumes, and to keep the noise of the set out of the working area. On the inside wall on which the welding set is mounted, are the starter for the motor and three, two-pole receptacles. Two of these are used to charge, and one to discharge, batteries.

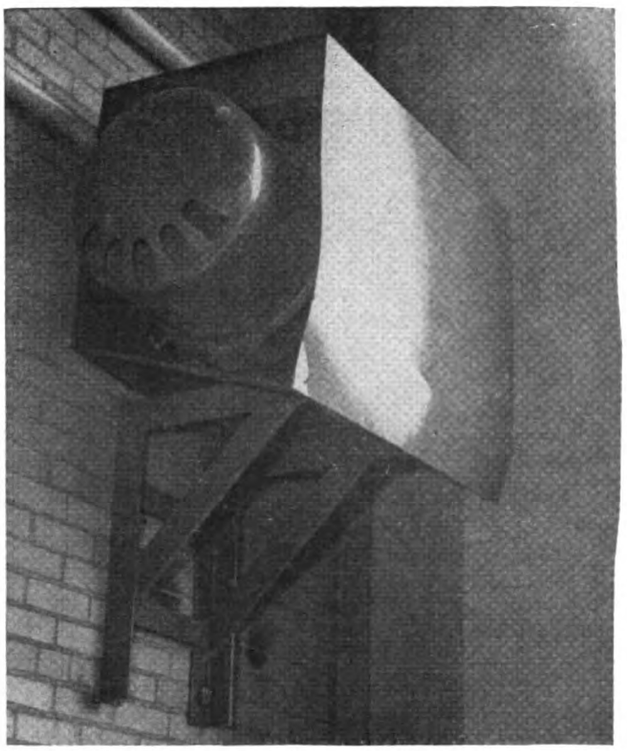
In the picture of the control switchboard, the operator's left hand is on the rheostat which controls the field of the charging generator. On the right-hand panel are two charging circuits on the left and right respectively. In each circuit is a 150-amp. fuse, a circuit breaker, and a reverse current relay, the latter two being mounted at the bottom of the panel. The operator's right hand is on the switch which closes the left-hand circuit breaker.



The new battery room in the Erie's Marion, Ohio shops.



Control panel for charging and discharging locomotive batteries.



Charging set mounted on a bracket on outside wall of battery room.

When batteries are plugged in on these two circuits, they may be charged in parallel at the same voltage by means of the generator field control.

At the top of the right-hand panel is a double-throw, double-pole knife switch. When this is thrown in one direction, it connects two sections of a General Electric dynamic braking resistor in series with the right hand charging circuit. The resistor is mounted on the back of the panel and the two rows of small knife switches across the center of the panel may be used to short out sections of the braking resistor. In this way, two batteries may be charged simultaneously at different rates. A motor-driven blower for cooling the resistor is connected across the battery.

When a battery is plugged into the discharge receptacle. the double-throw, double-pole switch is thrown to the other position. This puts the braking resistor across the battery. The small knife switches may then be used to control the discharge rate.

There are three ammeters on the panel. The one in the center shows discharge current, and the other two charging current.

Batteries are cycled to determine capacity, and batteries with less than 80 per cent of their original capacity are scrapped. State of charge is determined by specific gravity readings, and batteries are discharged to 1.75 volts per cell. Full sets of batteries are discharged at the three-hour rate.

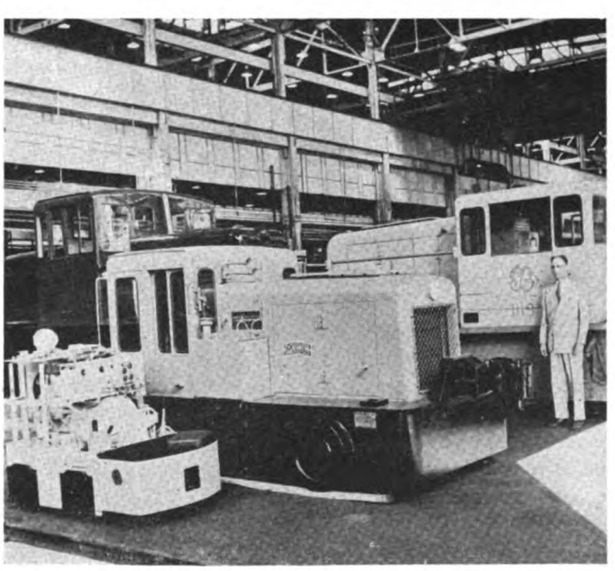
Midget Locomotives

■ Two small locomotives are now in production at the General Electric Company's Locomotive and Car Equipment Department in Erie, Pa. J. W. Brauns, manager of G. E.'s Industrial Haulage Sales, is shown with the 1½ ton-trammer (left) and the 10-ton diesel (center) which are now the company's smallest locomotives.

Designed for both surface and underground hauling, the 1½-ton diesel trammer runs on either 18 or 24-in. gage track. Its normal six-ft length can be shortened to four ft for lowering on mining hoist cages. It is only three ft wide and four and one-half ft high.

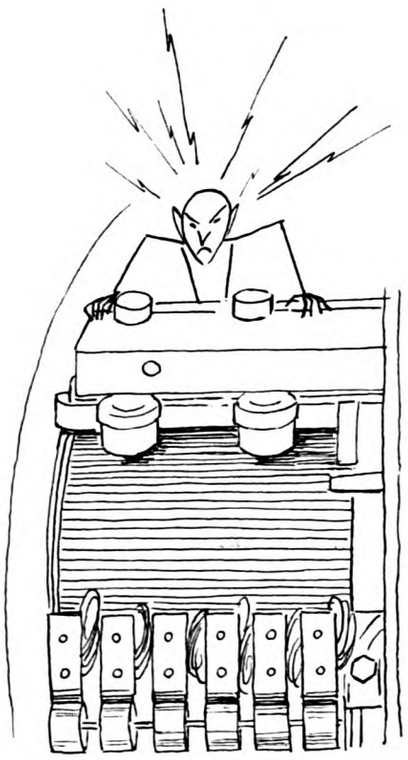
The 10-tonner is produced for industrial plant switching and other surface uses such as in quarries, open-pit mines, salt mines, jute and sugar plantations.

With the addition of these products to its line, General Electric now offers diesel and diesel-electric locomotives ranging in size from 1½ to 250 tons.



Progress of a traction-motor flashover as shown by the high-speed motion picture camera. The pictures shown were taken 1/2500th of a second apart, during tests made by the General Electric Company, in which the flashovers were caused deliberately.

The Two Basic Causes of Flashovers



High voltage is always looking for an escape path.

By Gordon Taylor

■ Flashovers on diesels are a great deal like the weather. Everyone talks about it, but not much is done about it. For quite a long time, we have kept flashovers under some control, but recently we have had too many cases of ground relay action, and a considerable number of severe cases of flashovers.

At one terminal, in particular, there has been a lot of honest effort made to correct this trouble, but flashovers have repeated in a number of cases where it was thought that the equipment had been properly cleaned.

Fundamentally, most flashovers are simply a leakage of current between brush holders of opposite polarities. Brush holders are so spaced that no normal voltage is going to jump from one to another.

A generator consists of circuits so insulated that it will contain or confine the current to its proper place. When a generator builds up its voltage, the commutator, brush holders, etc., are under electric pressure. As the pressure or voltage builds up, it is looking for leakage paths off of the commutator, or around the commutator, to reach its objective, which is the neighboring brush holder.

In other words, the current on the commutator is like a prisoner in a cell looking for a path of escape. When the current finds a streak of dirt, grease, or moisture, it then has a leakage path to the frame of generator or motor. The voltage will then take that escape path, to the opposite brush holder. What happens then is known as a flashover. The man who has to clean it up probably calls it something else.

The conditions that are favorable for flashovers are listed below:

1. Leakage paths on the armature and commutator of motors and main generators.

2. High voltage to provide the pressure for current to follow leakage paths. That is why most flashovers occur when the throttle is in the eighth notch.

3. A condition that causes momentary surges in generator voltage will induce flashovers. For example, slipping of wheels will unload traction motors momentarily. In a split second, the generator will have a rise in voltage which may be all that is needed to cause the current to take out over the leakage path.

4. Another well established cause of flashover is to operate the locomotive over a railroad crossing at high speed, where the brushes on traction motors will be bounced from good contact with the commutator. That will momentarily relieve the load on the main generator. The voltage will rise in a split second. If there is a leak-

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

age path, the current is on its way to cause a flashover.

5. A loose pigtail connection on a brush may wave around until it hits the commutator or a ground area. That will cause a flashover.

6. Short brushes which cause excessive sparking (due to poor contact) will fill the air surrounding the commutator with particles of material that will create leakage paths.

7. Control equipment (contactors, etc.) that is defective may cause a condition that will unload the main generator, which in turn will have a voltage rise that causes a flashover.

The above information boils down to this. Flashovers occur when high voltage finds a leakage path.

To hold flashovers to a minimum, observe the following rules:

1. Keep commutators and brush holder porcelains immaculately clean.

2. Check commutators for smoothness. Keep corner edges rounded and free of sharp points.

3. If a generator or motor has had a bad flashover that requires stoning, use a jig to hold the stone. Do not attempt to correct by hand stoning. Be certain to check the commutator with a dial indicator for out of roundness. If it is out, then correct by jig stoning. Also check for flat spots.

4. String bands must be kept immaculately clean. Do not make the mistake of thinking that insulating paint on a string band alone will correct the trouble. The band must be absolutely clean before paint is applied. Use quick drying paint, spread thinly. Remember that you cannot fool electricity. If there is any dirt under the paint, the electric charge will burrow beneath the paint for its leakage path. Anxiety to get the paint on a string band that has not been properly cleaned has been the cause of many repeat flashovers on units that were supposed to have been cleaned.

5. Maintain proper brush tension. Take care to secure brush pigtails when applying brushes.

6. Keep control apparatus properly adjusted and in good repair.

7. Have you noticed that many times it is the six o'clock brushholder that suffers the most damage? In it you will often find short brushes, or dirty brush holder porcelains. This is the brush holder that is hardest to get to, so apparently it is neglected. It is always a case of the hard-to-get-at items that cause the most trouble, so let us give the six o'clock brush holder better attention.

If maintainers will follow the above instructions, they will do much to control flashovers.

Now a word to the road foremen. Experience has proven that sudden unloading of a generator will cause flashovers. Locomotives should be operated with reduced throttle over railroad crossings and over dirt highway crossings where dirt or ballast may be on the rails and cause brushes to bounce on traction motors.

It is also known that high voltage will result from delayed forward transition. This sometimes provides the extra voltage peak that results in flashovers.

Enginemen should report mile post locations where flashovers occur. They should also report the speed and throttle position at the time of the flashover.

Remember that it requires a leakage path and voltage high enough to propel the electric charge along that path to cause flashovers. With that knowledge, we should be able to control this menace to diesel operation.

Spring Inspections Keep Summer Trains Cool

By David H. Noble

■ Spring house cleaning applies to air conditioning, too Once the frost is off the ground and old Sol starts wandering northward, it's time to work winter's havoc out of idle compressors. A thorough pre-season inspection will cure many of your air conditioning headaches before they develop.

Dirt Is Worst Offender

It should literally be a spring cleaning. Nothing can raise so much hob with a cooling system as dirt. Condenser and cooling coils will be covered with dirt that prevents free heat transfer between freon and air, motors will have accumulated brush and roadbed dust that clogs ventilating passages and provides leakage paths, and controls may be sticky from dirt in contacts and relays. In short, get the dirt out, and many of your troubles will be eliminated.

Dirt is an insulator, and it doesn't belong on either condenser or cooling coils. Unfortunately, it collects quickly on both, and unless removed you'll have a car that just won't cool when hot weather strikes.

Of the two, cooling coils are the easiest to clean. Most of the dirt is simply dust, and a good blowing with dry air will clear it out. If it's too greasy to blow free, a penetrating type cleaning solution will generally wash it out.

At the same time, clean the drip pan and condensate drain thoroughly. Drains frequently collect dirt during the heating season, and when hot, humid weather arrives a cascade of water splashes out of the return air grill. Needless to say, the goodwill of any passengers caught in the deluge is somewhat dampened.

Condensers

Clean condensers are just as important as clean cooling coils, but a thousand times harder to obtain. Roadbed dirt, brakeshoe filings, and other trash settle on the tubes and fins and form a cement that defies removal. Nearly every air conditioning supervisor has his own method of condenser cleaning designed to suit his own dirt conditions. Very few are completely satisfactory.

Two factors are evident in condenser cleaning: (1) a method which removes stubborn dirt and sediment also removes too much of the condenser; (2) it's easier to

keep a condenser clean through regular attention than to clean it after a year of neglect.

Baking and blowing remains one of the safest methods of condenser cleaning, and will remove a surprising amount of dirt. The condenser is first heated by disconnecting the sprays, blocking the air outlet, and running the compressor. As the freon pressure rises, so does the condenser temperature, until by the time the high pressure switch shuts the unit down it should be 125 deg F or better. The slight expansion of the tubes will break away much of the caked dirt, and a good blowing will clear it out. Several cycles of heating and blowing will work wonders, and best of all, it will not hurt the condenser.

Naturally, it will pay to watch the high pressure gage closely during the heating cycle, for too much pressure could rupture a condenser tube. The high pressure switch should protect the unit, but check frequently to be sure the pressure stays below 250 psi.

Spray condensers, which are the most difficult to keep clean, are being superseded by dry and flooded types, which require much less cleaning attention. While dry condensers collect a large amount of dust and roadbed dirt, it generally yields readily to blowing or washing with a mild soap. And if the condenser sumps are flushed regularly, a flooded condenser will require almost no cleaning between shoppings.

See that condenser sprays are checked too. Flush out the spray line, clean the strainer, and wash the nozzle, taking care not to damage the spray tip. Then check the pressure regulator setting in accordance with the manufacturer's instructions. Too little pressure and you won't get enough spray water to keep head pressure down; too much and you'll waste precious water.

Check and set the high pressure, low pressure, and spray switches. The high pressure switch is a vital safety device, and deserves special attention. You may never have heard of condenser or compressor explosions—but it could happen with serious damage to equipment and possibly a personal injury. The low pressure switch prevents the compressor from pulling a vacuum on the low side of the system. Should system pressure ever get below atmospheric pressure, air and moisture could enter the system through small leaks and cause trouble, so the low pressure switch should trip at 3 to 5 psi.

The spray switch, or spray valve, starts the water spray on the condenser when head pressure reaches a certain point to provide additional condenser cooling. It is generally set between 135 and 150 psi in accordance with the manufacturers' instructions.

Motors

Motors need cleaning, too. They'll get a lot of wear and tear during the summer months, so a thorough inspection is a necessity. Use dry air to blow the interior of compressor, fan, and pump motors. Check carefully for signs of commutator trouble, overheating, and leaking grease or oil seals. Lubricate the bearings and check them for unusual noise. It's a safe bet that a clean, quiet motor will give good service.

Spring is a good time to renew brushes on all motors. That way you'll start the season right. Look, too, for signs of sticking brushes and see that brush boxes are clean and spring tension correct.

Grounds in motors and control circuits should be cleared. Nothing can cause erratic operation like an elusive ground. Grounds also endanger mercury thermostats, and if you have split mercury trouble you probably have ground trouble!

Blow the dirt out of the controls, and check relay and contactor operation. And as an extra check, it's well to see if the correct thermostats and setdown resistors are installed.

Look for freon leaks. Freon carries a trace of compressor lubricating oil with it, and a small leak at compressor gaskets, shut-off valves, sight glasses or tube joints is easily spotted by a patch of oily dirt. The escaping freon deposits a thin oil film near the leak, and it rapidly collects dust and dirt. Freon is expensive, and leaks tend to get bigger, so it pays to repair even the small leaks promptly.

Freon solenoid valves are another source of trouble, so check to see they operate as intended.

Compressors

For compressors and expansion valves, it's strictly "hands off." If the compressor is quiet, the freon pressures are about right, there are no leaks at the head gaskets or seal, and the oil level is correct, then leave it alone. And if the car cools properly don't fool with expansion valve settings. You should, however, check to see that the expansion valve thermal bulb is tightly fastened to the correct suction line.

And, as a final check, start the equipment and let it operate. If you've done a thorough job, you'll have a cool, trouble free car. Sure, it's a lot of work, but nothing means as much to passenger comfort and satisfaction. So get hot on your spring inspections if you want to keep your summer trains cool.

Letter to the Editor

Sand Blast for Rails

Los Angeles, Calif.

To The Editor

For a century we have been sanding by pouring sand on the rail by slight variations of the pattern of sand delivery, various pipe sizes, coverging nozzles, and sand traps.

I believe that we should try sand-blasting the rail. It would be a simple matter of changing sand-blast delivery with high pressure air,—a similar or modified arrangement of the same equipment used in sand-blasting today.

It would probably require less sand. A clean rail surface would be the result, with maximum adhesion. I think it is worth trying.

I am one of your subscribers to Locomotives and Cars, and was very much interested in "Wheel Slip—Science Tells Why", by R. K. Allen, in the October 1954 issue.

Waves Blackwood

Questions and Answers

Interchange Rules

This is the sixteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

170-Q—Where charge is made per Item 89-A for trimming spread lining of journal bearing as outlined in Item 5 of Section (j) of Rule 66, may additional labor charge be made per Item 89 of Rule 107?

A—Yes. Where journal bearing is removed separately to trim spread lining, charge may be made for one-half hour labor plus charge of 12¢ for trimming the lining. There has been some misunderstanding to the effect that journal bearings defective only to the extent of having spread linings may only be reclaimed in connection with the removal of all bearings from car for inspsction purposes when cars are repacked. However, this operation may be preformed in cases where bearings are removed separately for inspection purposes or where the bearings on other pair of wheels in unit type trucks are inspected in connection with change of a pair of wheels. This operation not only benefits the car owner in that it avoids permissible charge for a new bearing but also insures better performance than a new bearing in most cases because the bearing has already completely seated itself to full contact with the journal.

171-Q—In cases where it is necessary to back haul a badly damaged car from scene of wreck to a point where same can be loaded on another car and placed in condition for shipment to car owner, resulting in a longer haul than if car had actually been shipped from scene of wreck, and after home arrival of car the owner makes a change in plans and decides to dismantle instead of repair such car, thereby involving transportation charges to be paid by car owner, should the owner pay transportation charges for the complete distance moved on damaging road enroute home from the point to which it was back hauled and made ready for shipment?

A—Yes. In certain other cases in this same general category, wrecked cars might be taken from scene of wreck to a point closer to the home line to be placed in condition for loading and shipment to car owner and in such cases the car owner would actually benefit insofar as transportation charges are concerned. Therefore, over a number of cycles, the present rule should work out quite equitably for all concerned.

172-Q—In view of the uncertainty as to when charges versus car owner are proper for the application of details generally described on billing repair cards as "door post nailing strips", is it possible to define where charge for renewal is proper?

A—In cases where door post fillers or nailing strips standard to car are renewed, charge versus car owner is proper. However, where cleats or nailing strips are applied over regular door posts, with or without standard fillers, to facilitate application of grain doors or other means of door protection, such work is considered temporary repairs and no charge may be made.

173-Q—Where outlet cap is missing from discharge mechanism on a covered hopper car, is this considered as handling line's or car owner's responsibility?

A—This is classified as car owner's responsibility.

174-Q—Where car owner applies new wheels and axles to a new car which are mounted in conformance with the requirements of the Wheel and Axle Manual and two pair of such wheels are removed from car approximately three months later for reason specified on billing repair card as "oil seepage" may charge be made versus car owner for such repairs?

A—Yes. Rule 81 permits the removal of wheels from car having indications of being loose as evidenced by oil seepage. This may appear to be somewhat unfair but in all similar cases where wheels in question were originally applied by other than car owner, Rule 81 affords protection to the car owner for a period of one year. This provision should take care of the vast majority of cases in this category. Because of the importance of guarding against wrecks caused by loose wheels, sometimes determined only by the presence of oil seepage at inside of wheel fit, it is generally felt that the present provisions of this rule should be retained.

175-Q—Do the requirements of Interchange Rule 91 apply in case where bill dated November 14, 1952, is rendered in October, 1954, covering the return to car owner of serviceable material removed from a car which was wrecked in July, 1952?

A—The requirements of Rule 91 apply only to bills for car repair work and not to bills covering the return of serviceable material from destroyed cars or to other bills rendered under Rules 112 and 120.

176-Q—Where car owner makes repairs to own car on authority of defect card issued by another road and renders bill exactly three years later than the date appearing on defect card and includes regular reweighing charge in bill versus the defect card, is the damaging road required to pay such reweighing charge?

A—In such cases where the car is due for reweighing and restenciling under the provisions of Rule 30, the carowner is responsible for light-weighing of car and no charge should be made versus the defect card for this work. It is not proper to compute the time limit requirements for reweighing from the date car was damaged but rather from the stenciled date which appears on the car.

177-Q—Does Note 1 following Paragraph (b-8) of Rule 3 or Section (m) of Rule 17 govern charges for brake beam safety supports applied in 1954?

A—Charges for such work should be made in accordance with the requirements of Section (m) of Rule 17.

178-Q—Where Type E 5 x 7" coupler is applied and Type E coupler of same size removed by a foreign road and car owner later executes joint evidence to prove that car carried stenciling indicating 6¼ x 8" type E coupler standard thereto, should the repairing line issue its defect card to cover wrong repairs?

(Continued on page 76)

the Difference!

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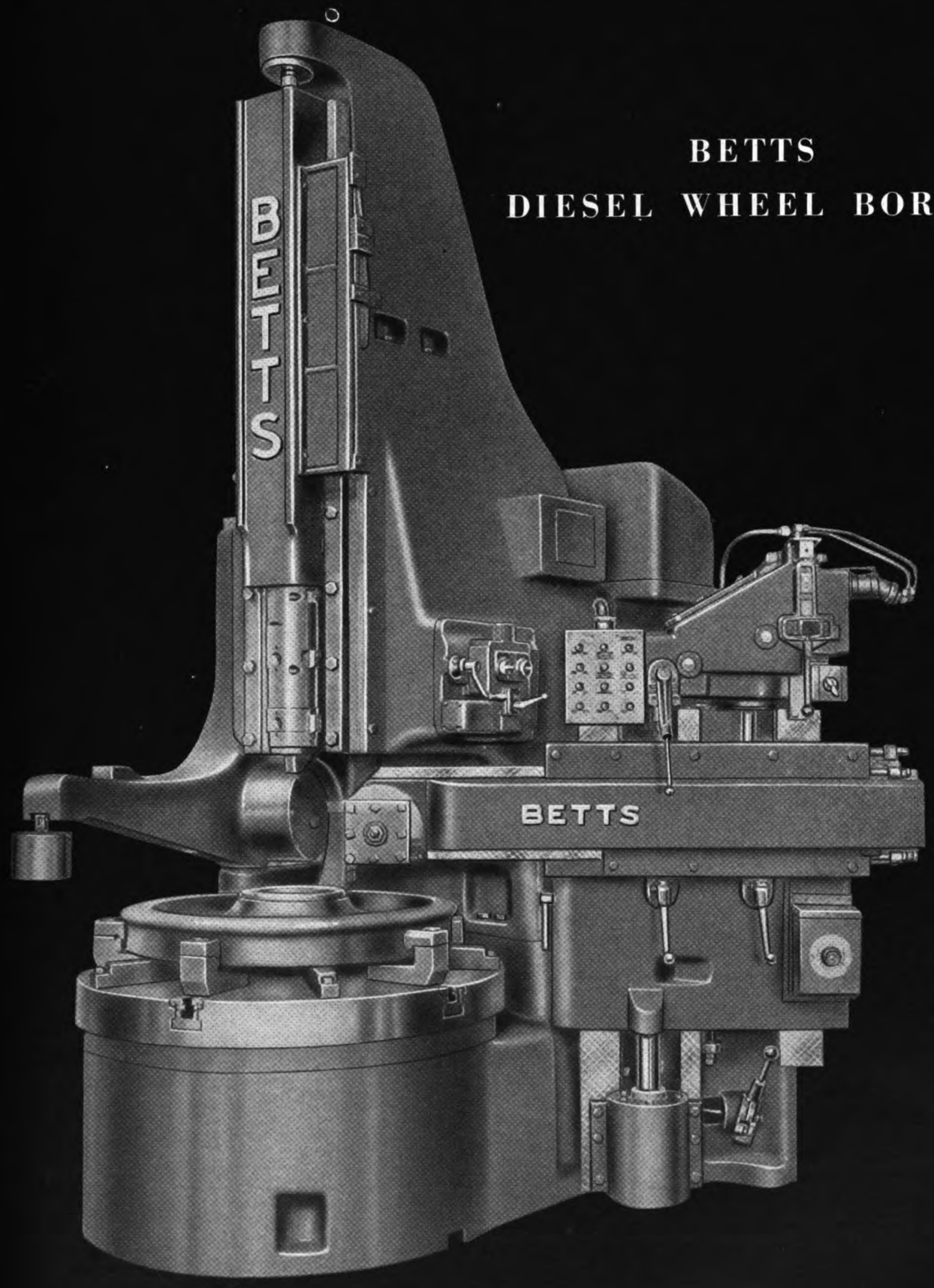


COMPANY, ROCHESTER 10, N. Y.

Birmingham Company, Incorporated

(*Continued from page 71*)

A—Yes. Defect card for labor only should be issued in accordance with the substitution table under Paragraph (c-2) of Rule 17.

179-Q—Where journal boxes of car are repacked under the provisions of Paragraph (g-2) of Rule 66 and charge is rendered for one-half of the allowance specified in Rule 101, at the same time renewing five of the eight journal bearings involved and rendering additional charge of 2½ hours for labor, thereby bringing total charge equal to the full allowance for repacking such journal boxes, would this be proper?

A—Where charge is rendered for one-half of the allowance specified in Rule 101 for journal boxes repacked under the provisions of Paragraph (g-2) of Rule 66, additional labor charge for journal bearings renewed at the same time is proper only to the extent that total charge for repacking plus labor for renewal of journal bearings will not exceed the allowance in Rule 101 for complete repacking of journal boxes.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G177-Q—Where is the control air pressure regulator located?

A—Behind the steps leading into the operating cab on the right (engineman's side) of the locomotive.

G178-Q—How is the "control air" pressure indicated?

A—On a gauge next to the distribution panel.

Ground Relay

G179-Q—Where is the Ground Relay located?

A—Behind the small glass window, Fig. 1-11, on the engine side of the electrical cabinet.

Electrical Control Cabinet

G180-Q—What does the electrical control cabinet contain?

A—The various contactors, relays, and other equipment necessary for the electrical and electro-pneumatic control of the unit.

Alarm Bell and Signal Lights

(Manual 2310, page 121)

G181-Q—Where are the alarm bells and signal lights located?

A—One alarm bell and 4 signal lights are located on the engine room side of the electrical cabinet, Fig. 1-11.

G182-Q—What do these lights indicate?

A—The lights indicate hot engine, boiler stopped, low oil and alternator failure.

G183-Q—What are the indications in case of an alarm?

A—The bell will ring in all units, but a light will be lit only in the unit affected.

Cooling System

(Manual 2310, page 400)

G184-Q—What functions to circulate the water for cooling purposes?

A—Water is circulated through the engine radiators and oil coolers by two pumps mounted on the engine.

G185-Q—How is cooling air through the radiators controlled?

A—By shutters and four electrically driven cooling fans.

G186-Q—Is the operation of the fan and shutters manually controlled?

A—No, their operation is entirely automatic.

G-187Q—Under normal conditions what will the temperature of the engine cooling water be held at automatically?

A—Under normal conditions the temperature of the engine cooling water will be controlled so that the gauge will read in the green area (120-190 degrees).

G188-Q—Where is this gauge located?

A—On the inlet of the left water pump.

G189-Q—What functions to provide a method of altering the sequence of the fan and shutter operation?

A—A Summer-Winter selector switch, located in the AC contactor panel.

G190-Q—What takes place with the switch in Summer position?

A—The shutters will open before the first fan (#1) is turned on.

G191-Q—What takes place with the switch in Winter position?

A—In the Winter position the shutters will open simultaneously with the turning on of the third fan (#3).

G192-Q—What is the action in the event of excessive cooling water temperature?

A—The high temperature alarm switch will close, causing a red light to show in the unit affected and alarm bells to ring in all units.

Operating Water Level

G193-Q—How are the operating water levels indicated?

A—Operating water levels are stenciled on the water tank next to the water gauge glasses, to indicate minimum and maximum water levels with the engine running or stopped.

G194-Q—What is the minimum water level for engine operation?

A—The engine should never be operated with the water below the low water level (Fig. 4-2).

G195-Q—What does progressive lowering of the water in the gauge glass indicate?

A—Indicates a leak in the cooling water system and should be reported.

G196-Q—How is the water system filled?

A—Either through the filler pipe located on the roof of the locomotive above the water tank, or through the filler pipe at the rear of the unit on either side.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F178-Q—What is another indication in case of low lube oil pressure?
A—A push button on the engine side of the governor housing will move out approximately 3/8 inch, exposing a red band around the button.

F179-Q—What can be done to stop the alarm?
A—1. Push in button on governor. This will put out yellow low oil alarm light. 2. Isolate engine. This will stop alarm bells and put out blue alternator failure alarm light.

F180-Q—Will the push button trip if the engine stops for any other reason?
A—No, only from an actual low oil alarm.

F181-Q—What feature is provided to assist in determining the cause of low oil pressure?
A—A time delay is provided so that after a low oil alarm the engine may be started and idled for approximately forty seconds.

F182-Q—Can the engine be put "on the line" during the forty second time delay period?
A—Any such attempt will cause an immediate shut down if the low oil pressure condition is still present.

Load Regulator

(Bulletin 1706—101-A, page 29)

F183-Q—What does the load regulator consist of?
A—The load regulator, included in the governor housing, consists of a commutator type rheostat in the exciter battery (4 pole) field, with the rheostat brush arm operated by a hydraulic vane motor.

F184-Q—How is the vane motor operated?
A—By governor oil controlled by the pilot valve in the governor.

F185-Q—Is the operation of the vane motor brush arm visible?
A—Yes, it is visible through a window.

F186-Q—What is the brush arm travel?
A—Brush arm travel is from 7 o'clock at minimum field (marked MIN) to 5 o'clock at maximum field (marked MAX).

F187-Q—What is contained in the governor?
A—The governor contains a load control pilot valve which is connected to the tail rod of the power piston and also the speed setting piston by a floating lever and linkage.

F188-Q—When will the governor pilot valve be centered, or at its balance point?
A—When the fuel injection setting is correct for the speed setting.

F189-Q—What takes place if the engine load tends to exceed the rated figure for any engine speed?
A—The balance between the power piston (controlling fuel injection) and the speed setting piston will be disturbed, causing the load control pilot valve to allow governor oil to flow to the load regulator.

F190-Q—How does the load regulator now respond?
A—The regulator will move toward minimum field, or in a direction to insert more resistance in the exciter battery (4 pole) field.

F191-Q—What is the result of this regulator movement?
A—The load on the main generator is reduced and the engine is prevented from overloading at any engine speed.

American Locomotive

Diesel-Electric Locomotives

This series of Questions and Answers pertaining to Alco diesel-electric locomotives with General Electric electrical equipment is a continuation of a series, the first of which was published in the October 1950 issue of Railway Mechanical & Electrical Engineer. The references to manuals and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

1155-Q—What is the next operation?
A—Move the generator into engagement with the engine generator adapter. After the crankshaft and armature spider fit have engaged a short distance, the generator frame will start to engage the bore of generator adapter.

1156-Q—What precaution must be taken?
A—Do not pull into full engagement until the coupling bushings are partially entered. Use two foot hard wood boards 1½ in. thick to hold generator away from adapter.

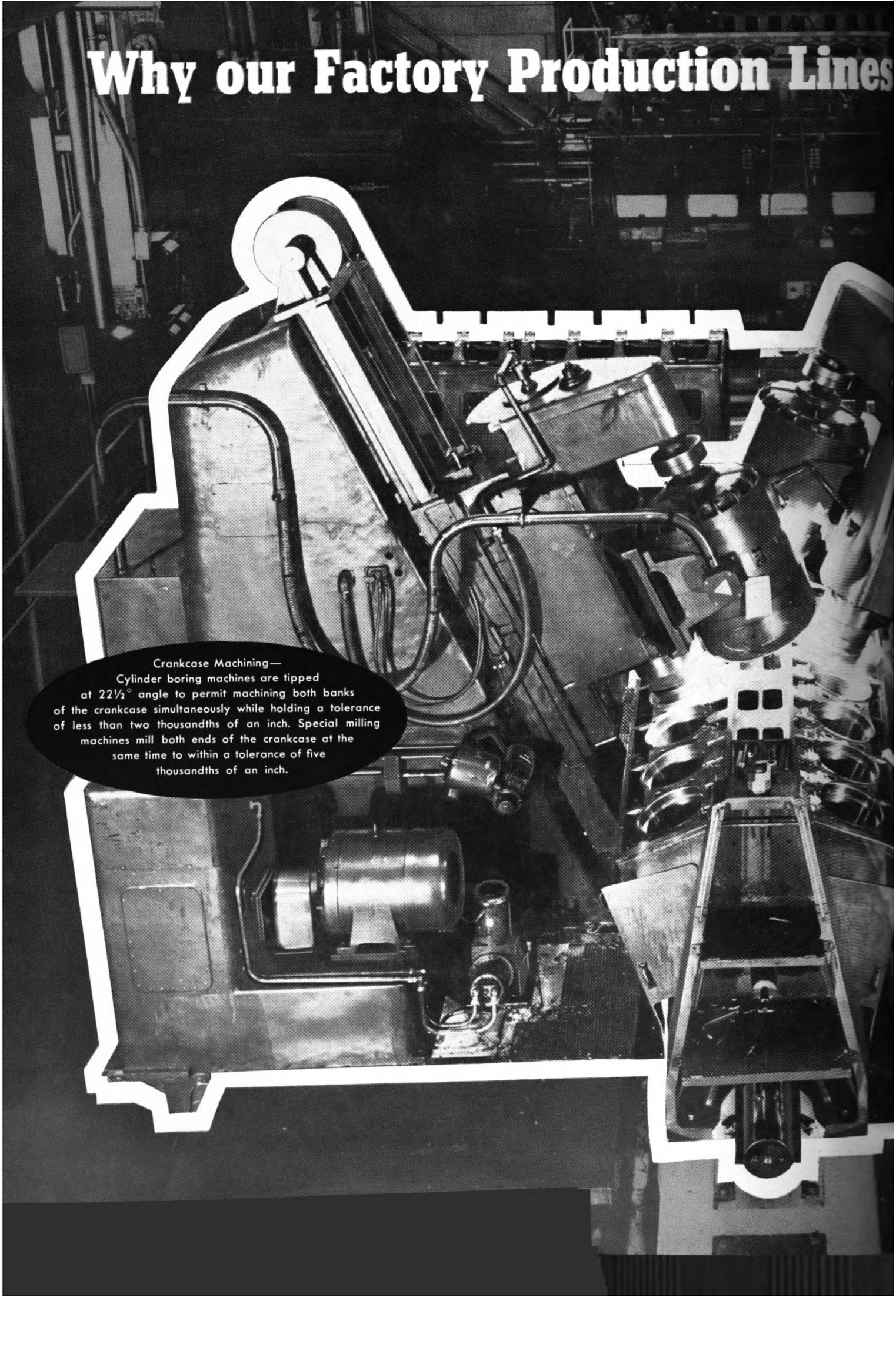
1157-Q—Describe the final action.
A—Remove cardboard strips from space between armature and poles. Tighten stud nuts between generator adapter and generator frame. Tighten and lockwire bolts.

Applying New, Reconditioned or Exchange Generator with Belt Driven Auxiliaries (Generator not balanced)

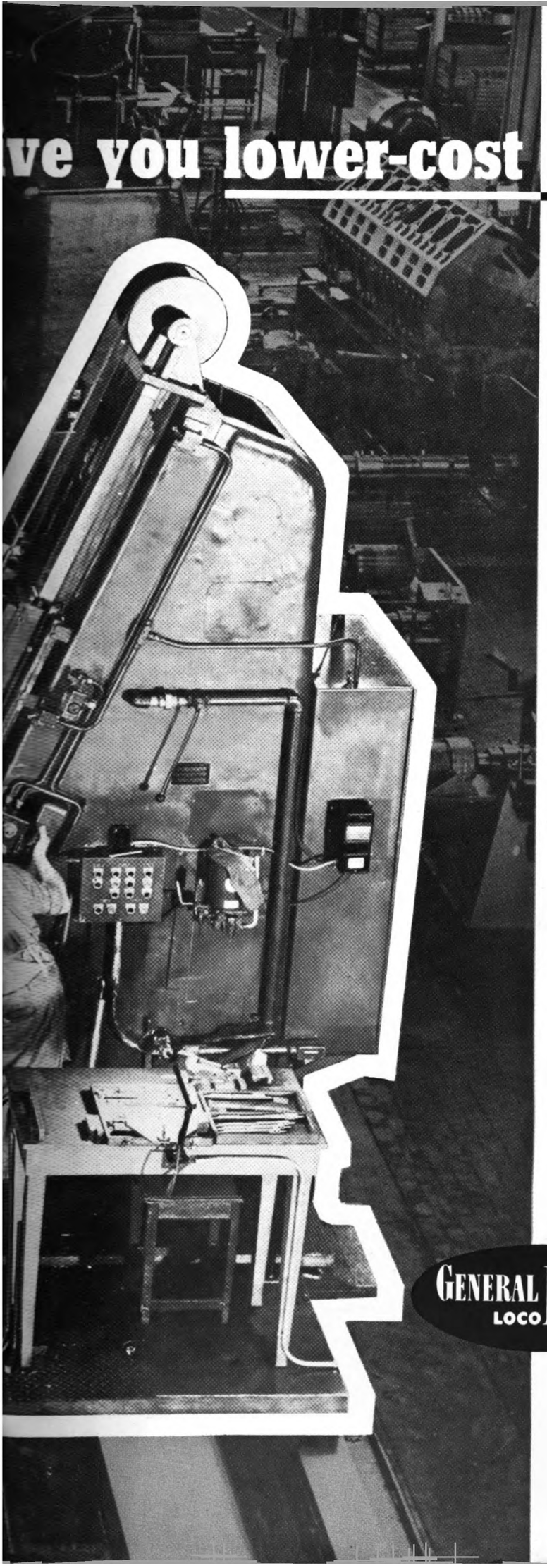
1158-Q—What is the initial operation under above conditions?
A—With generator removed from the engine and the

(Continued on page 80)

Why our Factory Production Lines



Crankcase Machining—
Cylinder boring machines are tipped at 22½° angle to permit machining both banks of the crankcase simultaneously while holding a tolerance of less than two thousandths of an inch. Special milling machines mill both ends of the crankcase at the same time to within a tolerance of five thousandths of an inch.



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(*Continued from page 77*)

fan attached, rotate fan until any one of the three groups of balance weight holes are at the top of the fan.

(*Manual TP-500, page 516*)

1159-Q—What action should follow?

A—While facing the fan, mark the lower right hand hole of this group for identification. When assembling the generator to the engine, the marked hole should be lined up closely with the center line of the crank nearest the generator. For completion follow all steps except No. 1 of the preceding article. Balance generator to engine.

Schedule 24 RL Air Brakes

1820-Q—What contact is utilized for this purpose?

A—Contact A7 of relay T. While shown on Plate 13 as supplied from B+, it will be explained later that the actual supply to contact A7 is determined by the position of another relay.

1821-Q—For the time being, what facts can be understood?

A—That if relay U is energized at the time brakes are applied and relay T drops out, relay U will continue to be held energized by the battery supply to contact A7-A6 of relay T and thence through contact C5-C4 of relay U to resistor R15 and the coil of relay U.

1822-Q—How do the circuits in Plate 14 compare with those in Plate 13?

A—They are identical with the exception that switch SW has been added in order to provide means for disconnecting the battery supply to the equipment when desired.

1823-Q—What other devices have been added?

A—In addition, the fuses F have been placed in the line.

1824-Q—What kind of fuses are they, and how are they replaced if necessary?

A—They are 5 amp midget fuses and can be replaced by unscrewing the plastic caps at the left end of the cabinet. The fuses will be pulled out when the cap is removed.

1825-Q—Is Plate 15 more complicated than Plate 14?

A—At first glance it would appear so, however, upon examination it will be found that this plate is identical in every respect with Plate 14 with the exception that an additional Wheatstone bridge has been added.

1826-Q—What is the purpose of the additional bridge?

A—The previous circuits had used only one bridge, which was for the application magnet wire. This is now the top bridge in Plate 15. An additional bridge, the lower of the two, is used to measure the resistance of the release magnet wire circuit.

1827-Q—Describe the lower or release bridge.

A—The same resistors are required for each bridge, and resistors R1-R2, etc., for the application bridge become R1A-R2A, etc., for the release bridge. The contacts of relays W and X, used for shorting the arms of the application bridge are unchanged and additional similar contacts are used for shorting the arms of the release bridge.

1828-Q—Describe the arrangement further.

A—Similarly an additional detector relay Z is used, which performs the same functions as relay Y. The contacts of these relays are placed in series to control the directional relay V and the time delay relays W and X in order to insure that both relays Y and Z are picked up at the same time and released at the same time.

1829-Q—With the contacts so arranged, what is the effect?

A—The failure of one relay to release at the proper time will stop the pulsing action just the same as if only one bridge were being used.

1830-Q—Describe further additions shown on Plate 15.

A—An additional milliameter MAA is placed in series with relay Z and an additional contact A3-A4 of switch S is used to short the meter MAA. Finally, additional contacts C3-C4 and C5-C6 of relay T are used.

1831-Q—Why are these contacts used?

A—In order to disconnect the release bridge from the relay magnet train line wire when the brakes are applied.

1832-Q—What is shown in Plate 16?

A—The means for performing the operation to cause relay T to assume the release position when brakes are applied.

1833-Q—How the B1 master controller application and release contacts affected when an electro-pneumatic brake application is made?

A—The B1 master controller operates to close its application and release contacts. The release contact is maintained in a closed position at all times the brakes are applied, except when the brakes are graduated off. This contact, therefore, holds the release magnet energized and serves as a convenient means of determining when the brakes are applied.

1834-Q—What has this to do with relay T?

A—This means is made use of in controlling the operation of relay T. As described earlier, relay T is supplied from battery current through resistor R24.

1835-Q—What does Plate 16 show?

A—That this current flows through the lower of two coils in relay T.

1836-Q—Describe the connections in the upper coil.

A—The upper coil is connected to the release wire, and the circuits are so arranged that the current in the upper coil is opposite in direction to that in the lower coil.

PERSONAL MENTION *(Continued from page 11)*

W. H. Mims

office, Nashville, Chattanooga & St. Louis in Nashville, Tenn. Entered employ of CofG in February 1944, serving successively as assistant shop engineer at Macon; shop engineer; assistant mechanical engineer at Savannah; assistant general foreman, Savannah shops, and electrical engineer. Mr. Mims is a registered professional engineer, State of Georgia.

New York, New Haven & Hartford

HARVEY E. HALES appointed chief mechanical officer at New Haven, Conn. *Born*: Columbus, Ga., April 8, 1918. *Education*:

H. E. Hales

Industrial High School, Columbus. *Career*: Began with Central of Georgia in 1942, serving successively as telephone and telegraph maintainer, equipment engineer and electrical engineer until January 1949 when he was appointed superintendent of motive power at Savannah, Ga.

Norfolk & Western

F. W. BALTHIS, gang foreman, electrical department, Roanoke, Va., shops, appointed electrical foreman at Shaffers Crossing shop.

Chicago & North Western

E. J. FITZGERALD appointed master mechanic, Dakota division, with headquarters at Huron, S.D.

Northwestern Pacific

CLAIR B. FISH appointed master car repairer at Tiburon, Cal. Mr. Fish formerly assistant master car repairer, Western Division, Southern Pacific.

Southern

KIMBLE L. POLLITT, engineer cost control, appointed engineer quality control, Hayne shop, Spartanburg, S. C.

JACK R. BARKLEY appointed engineer cost control, Hayne shop, Spartanburg, S.C.

Union Pacific

L. L. HOEFFEL, mechanical superintendent at Los Angeles, transferred to headquarters at Salt Lake City, Utah.

Virginian

W. W. OSBORNE, master mechanic, Norfolk division, Victoria, Va., appointed assistant superintendent motive power, with headquarters at Princeton, W. Va.

W. A. GRIGG, general foreman at Mullens, W. Va., appointed master mechanic, Norfolk division, with headquarters at Victoria, Va.

R. R. MCDANIEL, assistant to general foreman at Mullens, W. Va., appointed general foreman at Mullens. Former position abolished.

SUPPLY TRADE NOTES

AMERICAN BRAKE SHOE COMPANY.—A composition brake shoe for railroad use, designated the "Diamond Comet," has been developed by American Brake Shoe and is ready for field testing, it was announced by *Kempton Dunn*, company president, on March 8. The new shoe formed of friction materials in an organic binder, wears longer and gives smoother, quieter stops than the cast-iron brake shoe. It was developed in the Mahwah, N. J., laboratories of the company after many years of research on materials and methods. The problem, according to Mr. Dunn, has been to eliminate the inherent tendency of composition shoes to cause greater wheel wear and to be less dependable in wet weather. Only actual railroad operation will show whether these shortcomings have finally been eliminated.

Field testing of the new composition shoe began on an eastern railroad last month. It requires some changes in the braking equipment of present cars. Another composition shoe, now under development in the laboratory, will be completely interchangeable with present cast-iron shoes without the expense of changes in brake rigging.

The company's experience with composition brake shoes extends back to post World War 1 when it acquired the Pittsburgh Filled Shoe Company. Since then the American Brakeblok Division has made composition friction materials for automobiles, trucks, buses and heavy industrial applications. The search for composition materials suitable for railroad use was intensified after World War II. From hundreds of combinations tested came the present shoe which the company believes warrants field testing.

Mr. Dunn said that the metal shoe has proved to be completely dependable under all weather conditions and under all loads. It costs less, both initially and in terms of wheel wear, than the composition shoe. The latter will have to show in actual operation that it produces dependable friction under all conditions without causing greater wheel wear, he said.

"If the new shoe overcomes the disadvantages of previous composition shoes tested by the railroads," said Mr. Dunn, "it can be produced in the company's facilities."

■

AMERICAN LOCOMOTIVE COMPANY.—Rear Admiral *Wilson D. Leggett, Jr.*, USN, chief of the Navy's Bureau of Ships, has been appointed vice-president of engineering. Mr. Leggett retired from USN service on March 31.

WORTHINGTON CORPORATION.—*William A. Meiter*, central sales manager at Detroit, has been appointed general sales manager, with headquarters in Harrison, N. J. *Clarence S. Wentworth*, manager of the Detroit district office, succeeds Mr. Meiter as central sales manager.

■

BABCOCK & WILCOX CO.—The assets and business of the *Globe Steel Tubes Company* of Milwaukee have been purchased by Babcock & Wilcox who will continue to operate the Milwaukee plant as a part of its Tubular Products Division. Operations at the plant will continue without interruption and present production personnel will be retained.

■

PERMACEL TAPE CORPORATION.—The Dallas, Tex., division office and warehouse of Permacel has moved to 9000 Denton Drive, Dallas 20.

■

VAN DER HORST CORPORATION.—*Dr. Hyman Chessin* has been appointed assistant director of research and development.

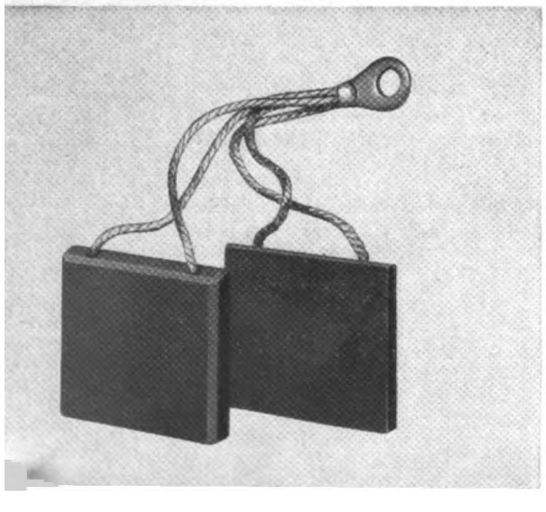
■

INDUSTRIAL BROWNHOIST CORPORATION.—*Warwick J. Hayes, Jr.*, sales

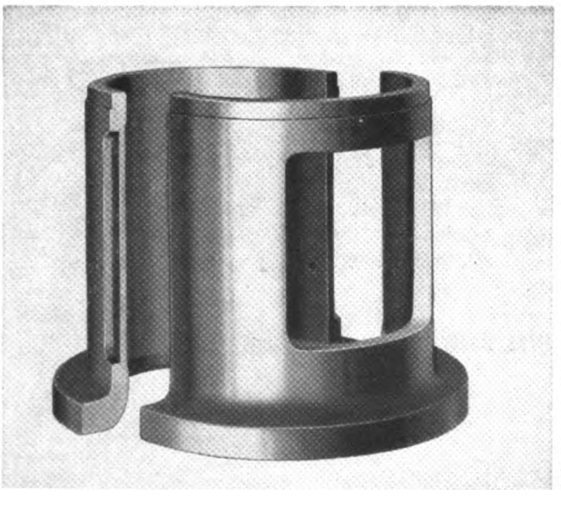
(Continued on page 84)

Using a precision involute checker developed by G.E., a quality control expert inspects a gear to make sure teeth have the accuracy necessary to resist fatigue failure.

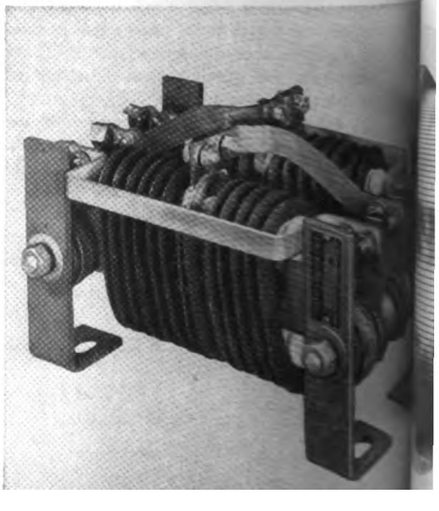
2. GE-RECOMMENDED CARBON BRUSHES are selected for the proper degree of hardness and grain structure to minimize wear and tear on commutator surfaces.



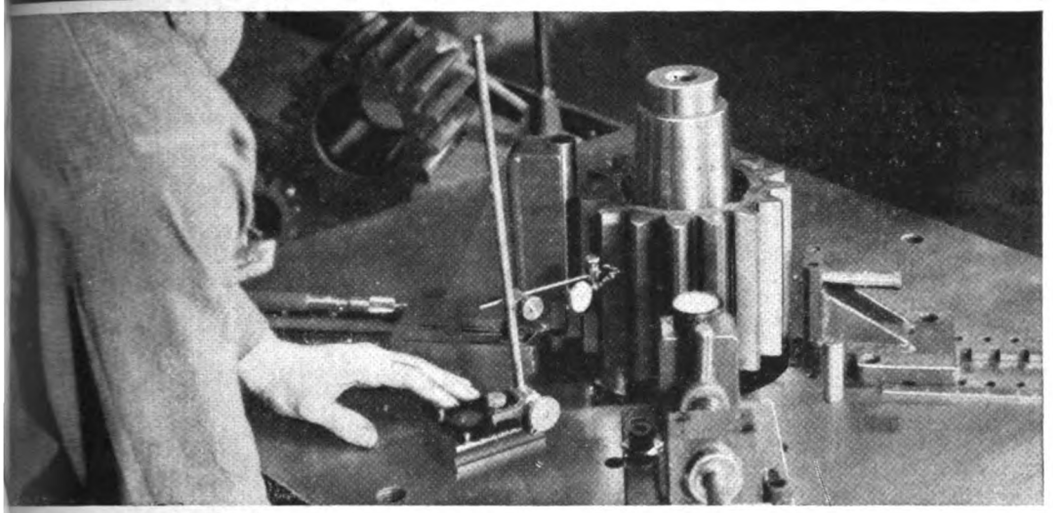
3. G-E MOTOR SUSPENSION BEARINGS give long life—have an oil-return feature which can save up to $85.00 per locomotive unit annually.



4. G-E RESISTORS have floating steel back bones that expand and contract freely with high temperature changes and therefore are not subject to buckling forces.



7 G-E replacement parts for better locomotive operation.



1. G-E GEARING is specifically designed to help cut maintenance costs. This GE-developed pinion stand permits inspectors to perform a quick check on all pinions for pitch line runout, parallelism of teeth with bore, outside diameter, and tooth thickness.

How your maintenance costs are cut with General Electric quality-controlled gearing

Because they are checked and rechecked throughout all phases of manufacture, General Electric gears and pinions can carry the heavy starting loads and take the running shock loads encountered in heavy freight and high speed passenger service. Through G-E quality control, you'll save maintenance dollars when you specify genuine G-E gears and pinions for your locomotives.

Backing up intensive quality control, G-E metallurgical research has developed materials to resist fatigue failures and to provide long-life gearing. With a combination of high hardness, superior strength, and the highest degree of accuracy, G-E gears and pinions give "new equipment" performance longer.

To get the most for your gearing dollar always specify genuine G-E gears and pinions. General Electric Co., Schenectady, N. Y. 128-21

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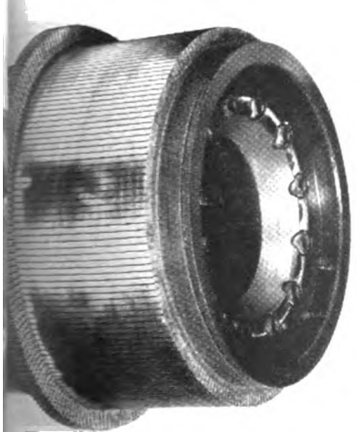
5. G-E COMMUTATORS retain smoothness in service because high-speed, high-temperature seasoning process sets segments firmly in place.



6. G-E ARMATURE COILS are available as part of complete rewind kits for your convenience. Every coil is dimensionally accurate and quality insulated for longer life.

7. G-E CONTACT PARTS break circuits quickly with minimum metal transfer because G.E. gives attention to the smallest parts.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. SAFETY EQUIPMENT. *Willson Products, Inc.* 68-page general catalog (54) "Willson For Industrial Safety," divided into 4 sections (eye protection, head protection, respiratory protection, welding), with illustrations, descriptions and ordering information, gives the Willson line of industrial safety equipment.

2. WELDING SUPPLIES. *Air Reduction Co.* 36-page 2-color catalog (ADC 848) covers the complete Air Reduction line of arcwelding and oxyacetylene welding supplies and accessories.

3. SOCKET SCREWS. *The Bristol Co.* Two 20-page 2-color bulletins give features, manufacturing methods and applications of the socket screw line; includes tables of nominal sizes, basic dimensions, tolerances and engineering data.

4. SOLENOID VALVES. *J. D. Gould Co.* Bulletin (F-1) describes and illustrates new direct lift solenoid valves (Type F brass and Type G stainless steel), with renewable metal seats.

5. ELECTRIC TOOLS. *Porter Cable Machine Co.* 25-page catalog (101) describes 52 portable electric tools and kits with over 400 accessories, includes 150 photos of tools and their uses with specifications and prices.

6. FLAME ARRESTERS. *Air-Maze Corp.* Catalog sheet gives details of 8 models of Tank Vent Flame Arresters by Air-Maze; includes photos, operating and design data, and complete specifications with "how to specify" information.

7. GEARS & SPROCKETS. *Universal Gear Works, Inc.* 200-page comprehensive catalog gives specifications and prices on 8,000 stock items including gears, sprockets, chains, splines, etc.; shows also pictorially the manufacturing facilities of Universal.

8. CENTRIFUGAL PUMPS. *Worthington Corp.* 8-page 2-color bulletin (1230-B1) gives complete details of construction, specifications and component parts of the Blue Brute Contractors' Portable Self-Priming Centrifugal Pumps; rating charts show performance requirements.

9. RAILWAY CAR LIGHTING & AIR CONDITIONING BATTERY. *Electric Storage Battery Co.* Several unit file folder package on the new EH Exide-Ironclad battery for railway carlighting and air conditioning contains complete details, photos, specifications and "how to order" instructions; a sheaf of order instructions, form 5711 "announcement folder," and 36-page "The Development of an Engineering Idea" booklet also included.

10. PORTABLE JACKS. *Whiting Corp.* 8-page 2-color profusely illustrated bulletin (PJC-403) "More Lift For Your Money" gives complete details on electric portable jacks for railroad repair shops; includes on-the-job photos in railroad yards, shops.

11. AIR POWER SYSTEM. *Ingersoll-Rand.* 6-page fan-fold engineering service bulletin (213-A) "A Better Air Power System," chock full of tables, photos and diagrams, describes how to find if more air is being wasted than repair and renovation of distribution system would cost; tells step by step procedures to bring system up to accepted standards.

12. AIR DISTRIBUTION. *Barber-Colman Co.* 28-page catalog (F 6597) "Uni-Flo Air Distribution Products and Square, Rectangular & Lineal Ceiling Diffusers" describes, illustrates, gives specifications and performance data on the Barber-Colman line of air distribution products.

13. PUMPS & CIRCULATING SYSTEMS. *Gray Co., Inc.* Graco Powerflo 452 Catalog describes and illustrates Powerflo pumps, circulating systems and equipment for spraying or extruding liquids, semi-liquids or semi-solids used in production, construction and maintenance.

14. VERTICAL MOTORS. *U.S. Electrical Motors, Inc.* Multicolor bulletin (1868) "U.S. Unimount Motors, Vertical Solid Shaft & Horizontal Footless Motors" graphically illustrates the improved types of U.S. Vertical Solid Shaft Motors; shows cross-section views in color.

15. METAL CASTINGS. *American Brake Shoe Co.* 8-page booklet (B-101) "Absco Metal Castings" describes characteristics of the 5 engineering types of Absco metal produced here, lists properties, carries engineering data on hardenability.

16. COMPRESSORS. *Quincy Compressor Company.* 8-page 2-color folder (1000A) gives complete data, illustrates and gives specifications for water cooled Quincy compressors with Safe-Q-Lube for heavy duty industrial use.

Reader Service Department — **APRIL, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

Company .....

Address .....

City ..... **Zone** ..... **State** .....

(Continued from page 81)

manager, has been named vice-president in charge of sales, and *E. W. Taylor, Jr.*, chief engineer, has been named vice-president in charge of engineering. *Marshall A. Norby*, sales representative at Chicago, has been promoted to district sales manager there. *Richard E. McCoach*, sales representative at Philadelphia, has been appointed district sales manager at Cleveland. They succeed *A. P. Lyvers* and *J. A. Peppard*, respectively, who became consultants on special assignments.

■

R. Lee Mitchell

NEW YORK AIR BRAKE COMPANY.—*R. Lee Mitchell*, formerly assistant to the vice- president in charge of railroad sales, has been named general manager of the Railroad Sales Division. *K. E. Keiling*, who was vice-president in charge of railroad sales, has retired, but will continue as a director of the company.

Mr. Mitchell joined New York Air Brake in 1942 as manager of the Western Division, and in 1953 was appointed assistant to the vice-president in charge of railroad sales. Before joining the company he was a special representative for the Alpha Portland Cement Company, St. Louis, Mo.

■

WESTERN RAILROAD SUPPLY COMPANY.— *George L. Hudson*, executive vice-president at Chicago, has been elected president, succeeding S. E. Gillespie, who has retired but will continue to serve as consultant.

■

ACF INDUSTRIES.—*John H. Van Moss*, formerly western sales manager at Chicago, who, at the request of ACF, remained two years beyond normal retirement age as a sales consultant for western territory, has retired. He is now associated with his son, *John H. Van Moss, Jr.*, railway supply sales representative at Chicago.

■

A. M. BYERS COMPANY.—*Harry R. Rowland*, assistant general manager of sales, has been appointed general manager of sales, and *Edgar L. Fix*, assistant manager steel sales, has been named manager steel sales.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*Carroll V. Roseberry* has been appointed manager of a newly formed electric utility and transportation sales department. *C. F. Sponsler*, formerly

manager of the marine and land transportation section of the transportation sales department, has been appointed manager of the transportation section of the new department.

■

AIR REDUCTION SALES COMPANY.—A 20-min. movie, with sound, has been produced on the Heliweld Process—Airco's tungsten inert-gas arcwelding process for the rapid joining of light gages of the so-called "hard-to-weld" metals and alloys. The movie, "Nothing But the Best," shows manual, semi-automatic and completely mechanized Heliwelding equipment in use in customer's plants and is colorfully animated to show in detail how the process works. It may be borrowed from any Air Reduction office, or by writing the company at 60 East 42nd street, New York 17.

■

C. E. Carothers

WESTINGHOUSE AIR BRAKE COMPANY, AIR BRAKE DIVISION—*C. E. Carothers*, a representative at New York, has been appointed assistant manager, southeastern district, at Washington, D.C.

■

MILLER BEARINGS COMPANY.—*Earle M. Harshbarger*, formerly manager of railroad sales, SKF Industries, Inc., has become associated with the Miller Bearings at Lakeland, Fla., as a manager of the railroad department.

■

EDGEWATER STEEL COMPANY.—*George C. Gentry*, director of engineering and development; *Ross M. Heyl*, general superintendent; and *Paul J. Nicholas*, operating superintendent.

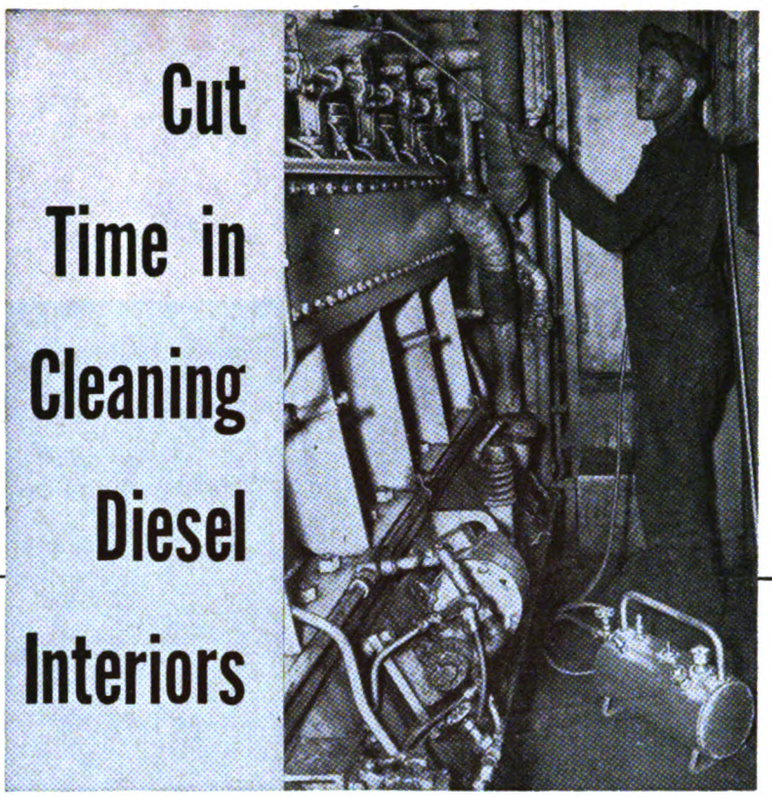
■

PYLE-NATIONAL COMPANY.—*William F. Botensten* has been appointed district manager, railroad sales, at Philadelphia, succeeding *M. M. Connell*, deceased.

■

DUFF-NORTON COMPANY, COFFING HOIST DIVISION.—The Duff-Norton Manufacturing Company of Pittsburgh has purchased the Coffing Hoist Company of Danville, Ill., and now operates the Coffing Hoist Division of Duff-Norton Company. Operations and personnel remain unchanged at the Coffing plant except that *Fredrick W. Coffing*, president and co-founder of the 26-year old company, has retired. He will continue to be associated with the Coffing Hoist Division, however, as a consultant. Mr. Floyd will be president

(*Continued on page 88*)



Cleaning the engine exterior, floors and walls need not be a time-consuming job. You can cut the time and manpower requirements of the job with Diesel Magnusol.

Safe and Sure

Diesel Magnusol is a fast-working cleaner, easily applied. You just mix the concentrated cleaner with water, and spray it on all surfaces to be cleaned. After it has soaked in for a short time, flush the cleaner and dirt away with water, leaving really clean surfaces. Diesel Magnusol is harmless to paints, to metals and to personnel. It is non-toxic and non-flammable.

For Very Dirty Jobs

. . . such as the interiors of switchers, mix Diesel Magnusol with safety solvent instead of water, but on road engines where a regular cleaning routine has been followed, Diesel Magnusol with water is all you need.

USE DIESEL MAGNUSOL FOR A MONTH

Order a trial drum. Use the Diesel Magnusol, as directed, for a month. If you are not completely satisfied at the end of the month, we will cancel the full invoice.

magnus CLEANERS

Railroad Division

MAGNUS CHEMICAL CO., INC.

77 South Ave., Garwood, N. J.

Please send us a copy of the Magnus Railroad Cleaning Manual.

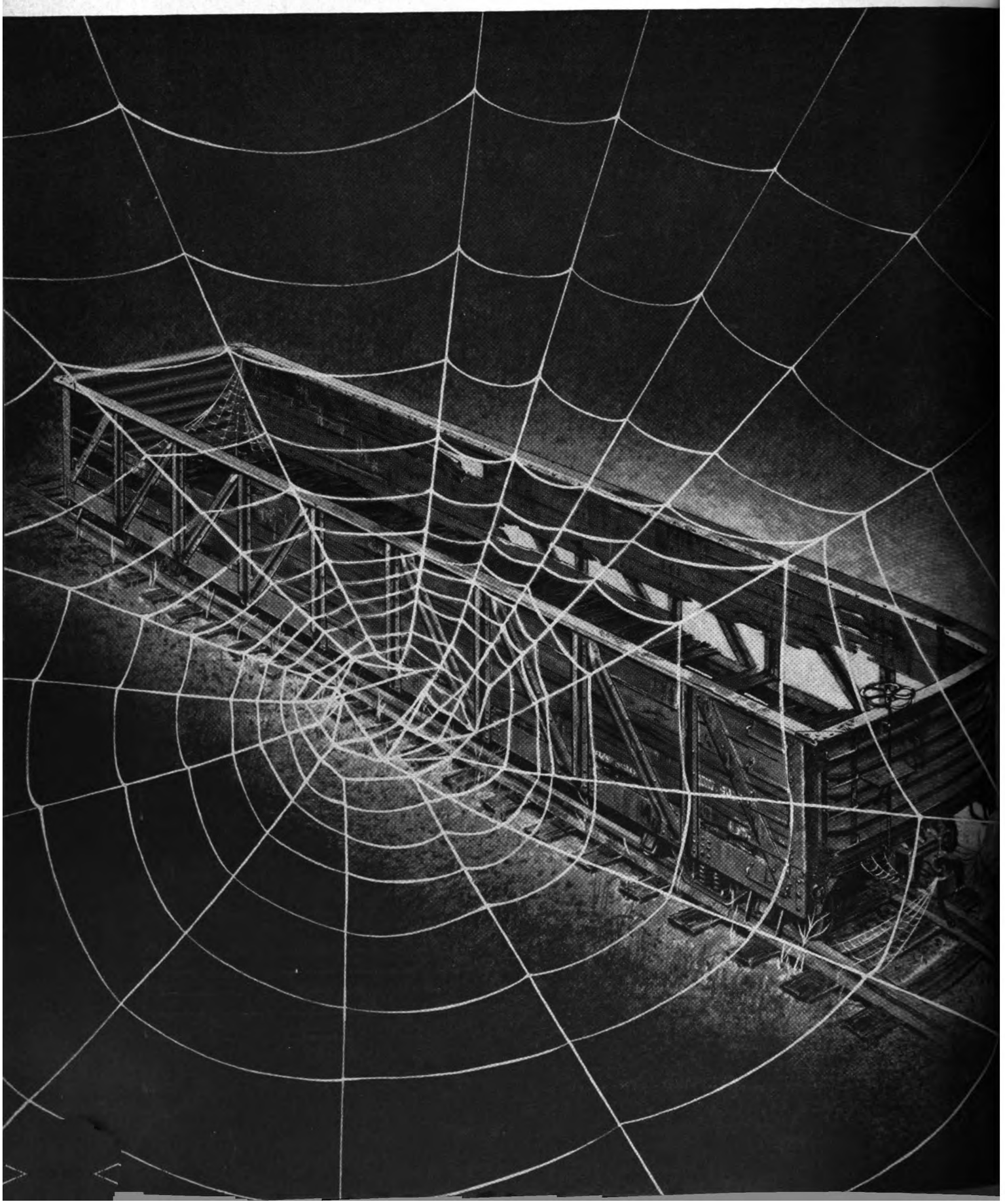
NAME_____ TITLE_____

RAILROAD_____

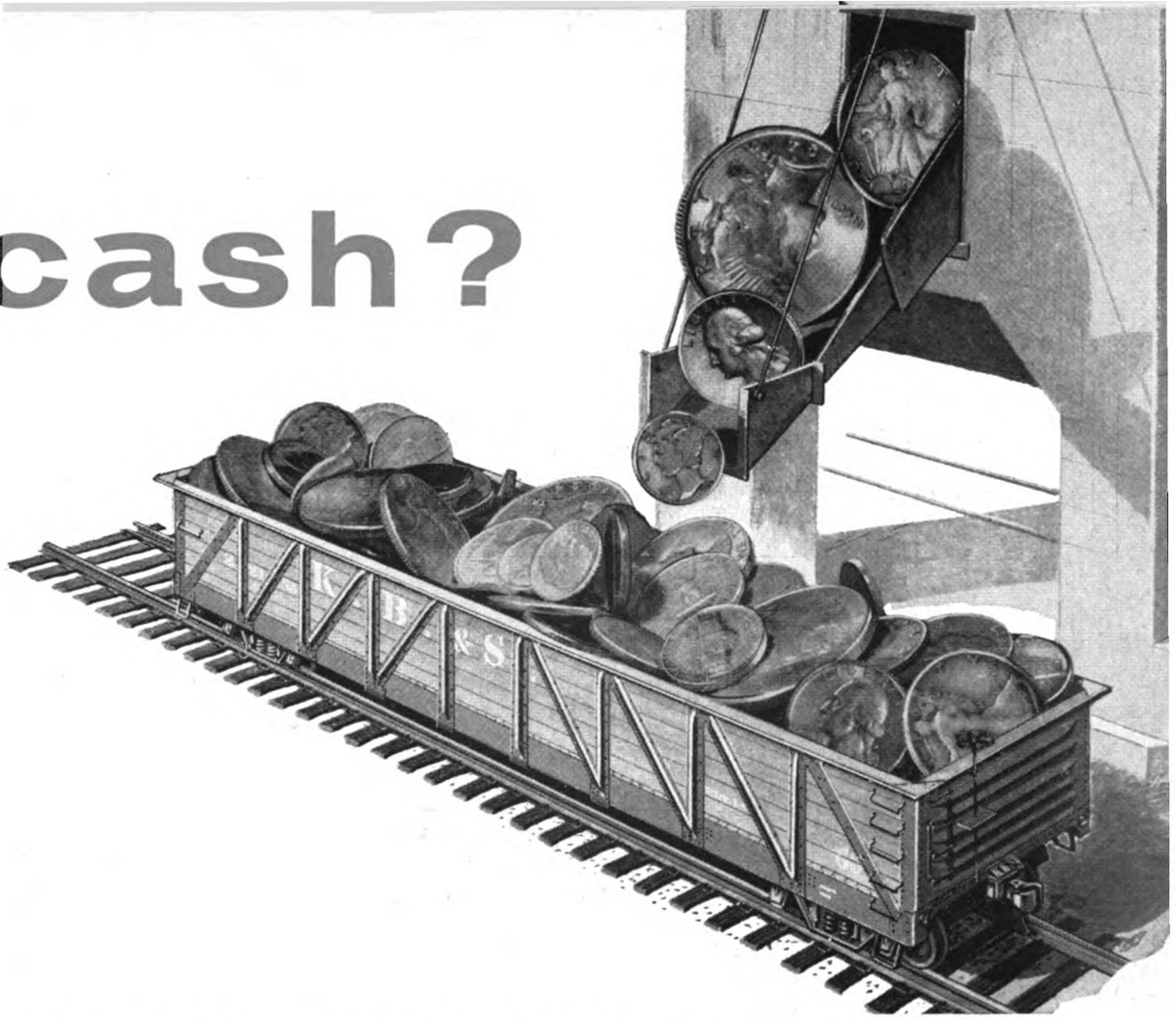
ADDRESS_____

CITY_____ ZONE____ STATE_____

Are your freight cars collecting cobwebs.



or cash?



You can eliminate out-of-service time, due to decay damage, by constructing or repairing cars with Koppers Pressure-Treated Car Lumber

Railroad records show that a car with *untreated* wood members usually lasts for only five years . . . before it's sidetracked for costly repairs to the lumber. And it may be months before a damaged car is earning revenue again; for railroads tell us it's necessary to wait until enough bad-order cars have accumulated to make it worthwhile to open the carshop or a repair track.

Service Life Tripled!

So it's not surprising that so many railroads have switched to Koppers Pressure-Treated Car Lumber. This lumber gives good service, on the average, for seventeen years. It outlasts *untreated* lumber better than three-to-one.

Revenue Increased!

Construction or repair of decking, sills, lining and other car members with Koppers Pressure-Treated Lumber assures those extra years of in-service revenue. And don't forget: this *protected* wood makes possible huge savings in maintenance—not to mention the out-of-pocket costs for switching cars to and from shops.

FREE ANALYSIS OF YOUR LUMBER PROBLEMS!

Let us analyze your lumber problems and then discuss with you the savings that can be effected by using Koppers Pressure-Treated Car Lumber.

KOPPERS COMPANY, INC.

Wood Preserving Division, Pittsburgh 19, Pennsylvania

KOPPERS®

PRESSURE-TREATED CAR LUMBER

(*Continued from page 85*)
of the Coffing Hoist Division as well as president of Duff-Norton. *J. R. Coffing*, vice president-sales for Coffing Hoist; *J. F. Bookwalter*, vice president-manufacturing, and *George Buck*, secretary-treasurer, continue to direct the affairs of the Coffing Hoist Division as a management committee.

■

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—The New York sales region of Electro-Motive has been expanded to include the Jacksonville region, and is now known as the Eastern region. *G. M. LaRiviere*, regional manager at New York, is manager of the new region. *Charles L. Moss*, Jacksonville regional manager, has become distric sales manager at New York, and *B. K. Wingerter*, district sales manager at Jacksonville, has been transferred to a similar position at Baltimore. *W. A. Stringer*, sales representative at Jacksonville, has been promoted to district sales manager there.

■

UNITED STATES STEEL CORPORATION, AMERICAN STEEL & WIRE DIVISION.—*Norman M. Sted*, Cleveland district sales manager, has been appointed assistant general manager of sales.

■

PITTSBURGH SCREW & BOLT CORP.—*J. M. Yahres*, president, has been elected chairman of the board, and *D. D. Greenshields*, president. Mr. Greenshields is now executive vice-president and director of National Screw & Mfg. Co., which positions he will resign to assume his new duties with PS&B as of May 1. In the meantime Mr. Yahres will hold the office of president as well as chairman.

■

TRANSPORTATION FILTER COMPANY.—The *Transportation Filter Company*, Chicago, and the *Hillsboro Filter Company*, Hillsboro, Ill., have merged. All manufacturing activities were consolidated at Hillsboro. The company, which manufactures fuel and lubricating oil filters for diesel locomotives, will be known as the Transportation Filter Company, with general offices at 80 E. Jackson boulevard, Chicago.

■

BUFFALO BRAKE BEAM COMPANY.—*Allen A. Crone*, superintendent of the company's Lackawanna, N.Y., plant, has been made research and development consultant, and has been succeeded by *Clyde W. Smith*, formerly superintendent of the die division of C. L. Gugler Machine Company.

■

B. W. Carkin

AIR-MAZE CORPORATION.—*Bruce W. Carkin*, has been appointed sales engineer of railroad and original equipment installations. Mr. Carkin was formerly associated with Electro-Motive Division of General Motors Corporation in design and development of locomotives.

■

FAIRBANKS, MORSE & CO.—*William G. Herzig*, manager of railroad sales, has been appointed manager of the railroad product sales department, railroad division, with headquarters as before at Chicago, succeeding *J. F. Marquitz*, retired.

C. H. Morse, Jr., manager of the locomotive service department, has been appointed western regional manager, Railroad division.

■

AEROQUIP CORPORATION has organized a Canadian subsidiary, *Prenco-Aeroquip, Ltd.*, at Toronto, it having recently acquired all assets of *Prenco Progress & Engineering Corp.* relating to its flexible hose line and self-sealing coupling business.

■

OKONITE COMPANY.—*Richard C. Waldron*, senior engineer, has been named manager of engineering.

Okonite has moved its San Francisco

NOW...ONE WELDER

Lincoln Idealarc gives you BOTH AC and DC welding current PLUS

- **Rectifier Welder for operation on single phase current**
- **Rectifier Welder with *both* voltage and current controls**
- **Arc-booster starting on *both* AC and DC . . . at a price comparable to plain DC Welders**

IDEALARC FOR FABRICATION—Choice of soft arc or forceful arc in *both* AC and DC speeds construction... assures solid welds in every position.

IDEALARC FOR HARDSURFACING—Choice of AC or DC in one machine means dependable results at low cost with every hardsurfacing electrode.

Get Facts Details on IDEALARC are in Bulletin 1343, available by writing The Lincoln Electric Railway Sales Company, 11 Public Square, Cleveland 15, Ohio. Railroad representatives of:

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

sales office to 701 Phelps street consolidating it with warehouse operations in new and enlarged quarters.

■

GARLOCK PACKING COMPANY.—*Ralph J. Hinkle*, vice-president has retired.

■

EX-CELL-O CORPORATION. — has acquired the *Michigan Tool Company*, which operates three plants in Michigan, and a subsidiary, *Colonial Tool Company*, Windsor, Can. Michigan Tool will continue to operate as a separate unit under its present management.

Obituary

F. Sargent

FITZWILLIAM SARGENT, vice-president —railway sales, the Budd Company, died on March 14 as the result of burns suffered while attempting to extinguish a fire in his home in Philadelphia. Mr. Sargent, who was 62, was a graduate of Harvard University (A.B. 1914). He began in the railroad supply business in 1915 and from 1931 until becoming associated with Budd in 1940 was in the coal business. In 1946, after serving in the sales department of the railway sales division of Budd, he was appointed railway sales manager, with headquarters in Philadelphia and New York. He was appointed eastern sales manager in 1945 and was elected vice-president in charge of railway sales in 1946.

■

FREDERIC SCHAEFER, 77, president of Schaefer Equipment Company, died at his summer home on Cape Cod, Mass., February 20.

■

CHESTER F. SAMPSON, western representative of the Franklin Balmar Corporation at Chicago, died on March 2 after a long illness. Mr. Sampson began his railroad career on the Michigan Central and entered the service of the Franklin Railway Supply Company, of which Franklin Balmar is a subsidiary, as a service representative in April 1923.

■

FREDERICK S. STALLKNECHT, 62, former manager of sales development for the Primary Battery division of Thomas A. Edison, Inc., died at the University of Pennsylvania Hospital, Philadelphia, February 12.

EQUIPMENT *(Continued from page 23)*

in two heavy-duty styles, one an approved safety type.

One type has an insulated ethyl cellulose case that will not shatter, crack nor dent and is resistant to temperature extremes. It has a self-lubricating, hand-replaceable insulated slide switch and a special lens guard made of polyethylene.

The safety unit is approved by the U. S. Bureau of Mines. It has the same features as the other model, plus an extra lamp in the bottom cap. The device is so designed that if the lamp is broken, the filament is snuffed out before it can ignite inflammable or explosive mixtures of gas in the surrounding atmosphere.

Both units are available in either the two-cell or three-cell sizes, with a ring hanger, and lateral-grooved case for sure grip. *National Carbon Compan, a Division of Union Carbide & Carbon Corp., 30 East 42nd Street, New York 17.*

Collapsible Tap

These Type MC taps have a micrometer adjustment in increments of 0.001 in. that permits quick and accurate sizing. sizes,

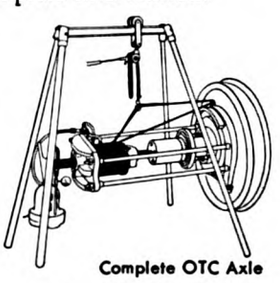
PULLS AXLE JOURNAL ROLLER BEARING IN *LESS* THAN 20 MINUTES

WITH NEW OTC 100 TON HYDRAULIC PULLER

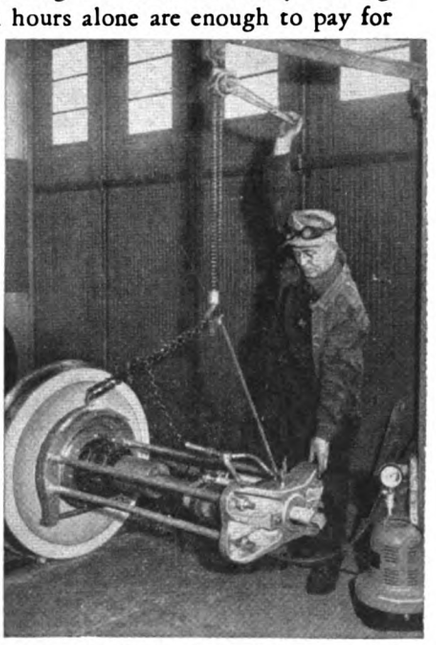
Yes, in 20 minutes or less the toughest Axle Journal Roller Bearing can be removed without pressing off the wheels — without distortion or damage. The new OTC 100 Ton Hydraulic Ram and attachments work on SKF or Timken Bearings — handle removal and installation with surprising speed.

Wheel fit is not disturbed; eliminating the need for costly turning and refitting. The savings in man hours alone are enough to pay for the tool in a short time.

This is only one of hundreds of pulling jobs which can be done easier, safer and faster with OTC Hydraulic Pulling Tools which are available in 17½, 30, 50 and 100 Ton sizes. Learn how you can save on every pulling job by writing for complete information.



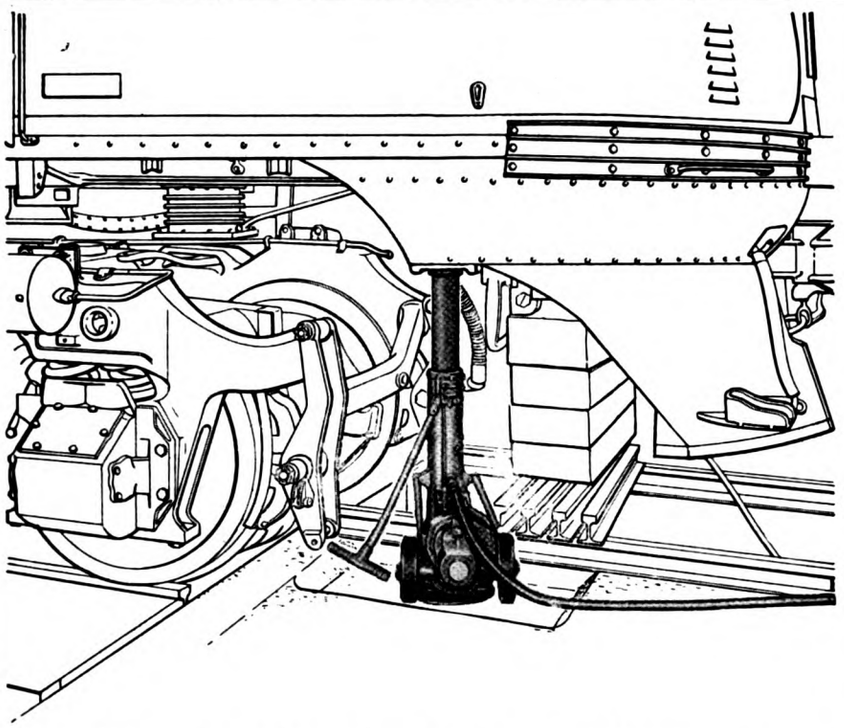
Complete OTC Axle Journal Bearing pulling unit with standard hoist frame.



Placing OTC 100 Ton Hydraulic Ram and pulling unit into position on Axle Journal Bearing. Electric pump at right then exerts necessary pressure to remove bearing without damage.

WRITE FOR FREE HYDRAULIC PULLER BOOK.

OWATONNA TOOL CO.
470 CEDAR STREET, OWATONNA, MINN.



How One Man Can Raise the Heaviest Diesel Locomotive in a Few Minutes!

Take two Duff-Norton Air Motor Power Jacks, wheel them into position under the locomotive frame, connect them with an air hose "Y," turn the valve that starts compressed air into the jacks' built-in air motors, then sit down if you wish and watch as the load goes up evenly, smoothly, safely—in a few minutes you can proceed with repairs. Locomotive trucks, for example, can be completely replaced in about 2 hours!

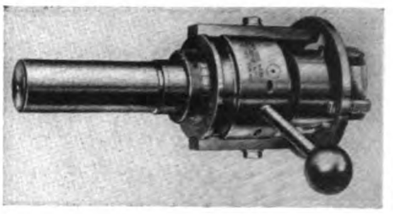
Tests conducted by various railroads in their own shops have shown savings in time and labor that pay for these air motor jacks in a few months.

Get the complete specifications of the various time and labor-saving Duff-Norton Air Motor Power Jacks. They vary in capacity from 20 to 100 tons. Write the world's oldest and largest manufacturer of lifting jacks for catalog AD-11E, the Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON

"Giving Industry A Lift Since 1883"

Jacks



range from 1 5/16 in. to 3½ in., inclusive.

Approximately three-fourths of the component parts of the series are identical and interchangeable. One complete tap and four sets of body parts will, in this manner, provide all five sizes of taps. The shanks are detachable from the tap body and can be furnished to fit any machine socket.

The taps can be used for either stationary or rotary operation. The chasers, thread ground in regular or overhanging lengths, are interchangeable with the chasers of the manufacturer's solid adjustable tap. *Modern Tool Works, Consolidated Machine Tools Company, Rochester 10, N. Y.*

Cutter and Tool Grinder

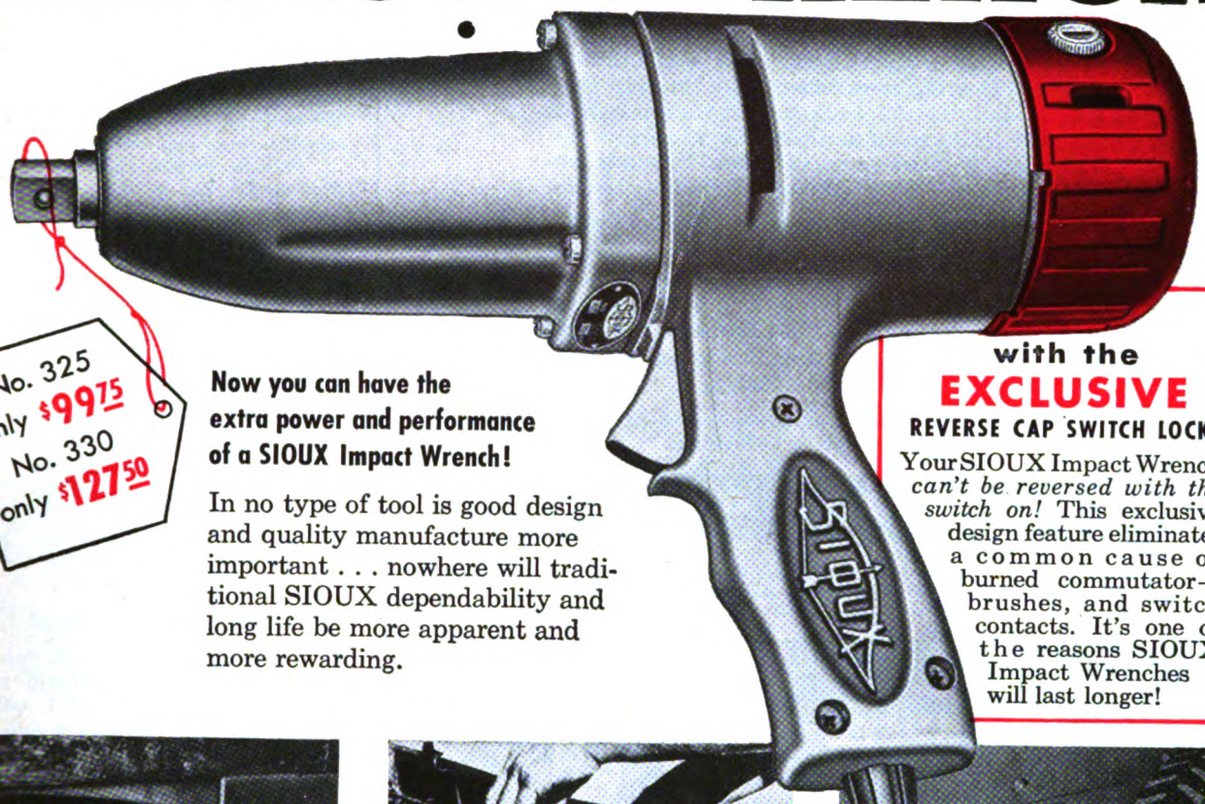
The No. 1 cutter and tool grinder, designed for grinding and reconditioning miscellaneous small tools and cutters, has a capacity of 8 in. swing and 15 in. between centers. It has a cartridge type grinding wheel spindle mounting with a double row of preloaded anti-friction bearings, packed in grease.

A reversible ½-hp motor drive, built-in to the wheelhead, provides the desired direction of grinding wheel rotation to suit any particular application. Spindle speeds of 6,260 or 3,730 rpm are obtained from a tooth grip drive belt and sheave arrangement. Grinding wheel collets are quickly interchanged by removing a socket head screw.

The 360-deg eccentric wheelhead swivel adds 3 in. to the conventional cross range of 4½-in., facilitating surface grinding operations. Another innovation is the swivel table "tange bar" taper setting device. Utilizing precision gage blocks, the taper

New SIOUX *Electric*

IMPACT WRENCH



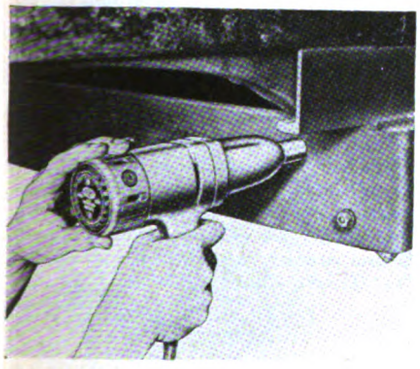
No. 325 only $99.75
No. 330 only $127.50

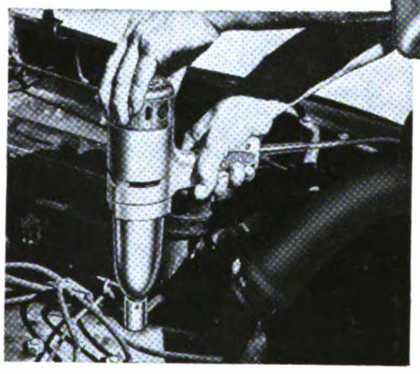
Now you can have the extra power and performance of a SIOUX Impact Wrench!

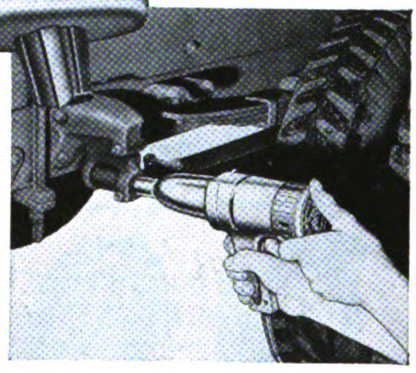
In no type of tool is good design and quality manufacture more important . . . nowhere will traditional SIOUX dependability and long life be more apparent and more rewarding.

with the EXCLUSIVE REVERSE CAP SWITCH LOCK!

Your SIOUX Impact Wrench *can't be reversed with the switch on!* This exclusive design feature eliminates a common cause of burned commutator—brushes, and switch contacts. It's one of the reasons SIOUX Impact Wrenches will last longer!







SPECIFICATIONS

Wrench No.	Capacity Bolt Size	Socket Drive Size	PRICE
325	3/8"-5/8"	1/2" sq.	$ 99.75
330	3/8"-1 1/16"	1/2" sq.	127.50

Free Speed R or L 2,000 RPM, Both Models; Impacts Per Minute 2,000, Both Models

For more information write today!

Please send complete information and prices on

SIOUX IMPACT WRENCHES

*NAME*_____

*ADDRESS*_____

ALBERTSON & CO., INC.
SIOUX CITY, IOWA, U.S.A.

USE SIOUX ALL THE WAY THROUGH . . . ELECTRIC DRILLS • SANDERS • POLISHERS
GRINDERS • SAWS • IMPACT WRENCHES • VALVE SERVICE EQUIPMENT

Special Railroad Mount

Strand FLEXIBLE SHAFT GRINDERS

Designed for RR Shop Use

For grinding, sanding, rotary filing, wire brushing, drilling, deburring or polishing. With this new Railroad Mount, you take the Strandflex machine right to the work. You'll find it invaluable for a variety of different jobs in diesel shops, car shops. Promotes efficiency; workers lift only the tool—not the heavy motor.

Also Gasoline Powered Unit for Bridge or Maintenance of Way Depts.

All-purpose compact 5 hp. gasoline engine powered STRAND Flexible Shaft machine, governor controlled operating speeds from 2200 to 3200 rpm. Ideal for grinding rail welds, wire brushing before painting, smoothing concrete, etc. Makes you independent of electric power and air compressors.

Write for details on STRAND Flexible Shaft Machines specially designed for railroad use.

FRANKLIN BALMAR CORPORATION

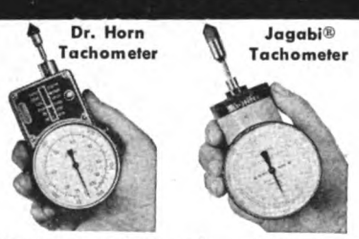
Woodberry, Baltimore 11, Maryland
***Chicago Office:* 5001 North Wolcott Avenue, Chicago 40, Ill.**

IF YOU MEASURE SPEED • • • YOUR BEST BET IS BIDDLE

Average Measuring RPM or FPM Jagabi® Speed Indicator

Dr. Horn Tachometer

Jagabi® Tachometer

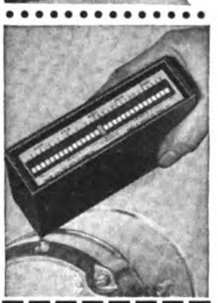


Instantaneous Speeds or Variations in Speeds. Write for BULLETIN 35-X

Frahm® Resonant Reed Tachometer

Quick Accurate Readings with Safety

BULLETIN 31-X



JAMES G. BIDDLE CO.
1316 Arch St., Philadelphia 7, Pa.
Please mail me ☐ Bulletin 31-X ☐ Bulletin 35-X. Thank you.

*Name*_____
*Job*_____
*Company*_____
*Address*_____

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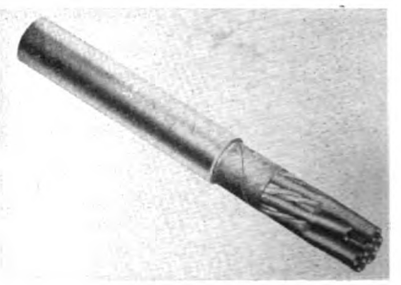
device enables the operator to quickly position the swivel table and obtain a higher degree of accuracy.

The double-end anti-friction spindle of the universal workhead accomodates No 12 B&S or No 5 Morse taper shanks on one end and No 50 series National Standard on the other end. Clearance setting dials on both the workhead and left-hand tailstock permit setting for predetermined clearance angles.

Electrical controls are built-in, recessed in a compartment at the front of the machine. A disconnect switch shuts off current if the door is opened. Additional safety is provided by the transformer which reduces the voltage to 110 at the push buttons. A wide variety of attachments extend the range of the machine for sharpening miscellaneous small cutters including those of sintered carbide. *Cincinnati Milling Machine Co., Cincinnati* 9.



Aluminum-Sheathed Cable

Designated Okotherm-insulated, this aluminum-sheathed cable is designed for continuous operation at 150 deg C and up to 200 deg C, under certain conditions. Available for both power and control cable circuits, it is said to provide a labor-saving advantage through its built-in aluminum conduit.

According to the manufacturer, these are the main advantages: flame and heat resistance; no conduits and related "pulling-in" problems; moisture and ozone resistance; space-saving small diameter; light weight for easy handling; high dielectric strength; and corrosion resistance. *The Okonite Company, Passaic, N. J.*

Self-Propelled Welder

This electric-driven self-propelled undercarriage supports electric welding sets such as

(*Continued on page 96*)

They've found the answers to some problems that are unique in railroading . . . on

miles of the toughest main line!

• To fully appreciate what "Orinoco" means to railroading, you'd have to run a 15-thousand-ton train through 87 miles of rough terrain involving a 3% grade. That, in brief, describes United States Steel's engineering feat that stretches from the Orinoco mine face to the Puerto Ordaz docks in Venezuela.

Hauling heavy loads under these conditions calls for unusually rugged ore cars. Magor Car Corporation is providing the answer: cars that are designed to take extreme punishment—*almost continuously*. Otherwise, repairs would run costs sky-high in an area with restricted maintenance opportunities.

Smooth-riding ASF Ride-Control* Trucks mean less damage to the cars and roadbed. ASF Simplex Clasp Brakes ease the loaded cars down the grade, and ASF Type "F" Interlocking Couplers provide the needed additional strength and protection against accidental train partings.

It's a source of pride that ASF was selected to furnish the basic running gear, of course. The problems of the Orinoco were a challenge to the best we had to offer. Helping to solve them is the kind of experience that keeps ASF in step with progressive railroading.

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Lix is harmless to all types of metals during the cleaning cycle. Cleans any metal safer and faster...and in the same tank. Leaves no granular deposit on close tolerance screw threads.

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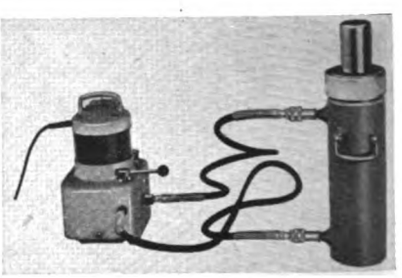
KANSAS CITY, MISSOURI

(Continued from page 92)

the Lincoln machine illustrated. Rugged construction, simple design and low cost are advantages claimed for this undercarriage which permits bringing the welding machine within a few feet of the welding operation in railway shops and car repair yards, for example, utilizing short cable leads. This saves man-power, time, cable and contributes to better welds, plus better satisfied workmen due to greater ease in operation.

Two models of Ellingsworth electric undercarriage are available, the Model 60 for 200-amp machines (42¼ in. wide) and the Model 70 for 300- and 400-amp machines (51 in. wide). Propulsion is supplied by an electric motor with gear-head designed and wired to operate from dc current supplied by the welding generator. The motor is rated at ¾ hp and built to absorb 2 hp shock loads. Both motor and gear reducer are equipped with ball bearings for long trouble free operation. Drive to the main wheels is by a chain and sprocket, the chain being easily disengaged for over the highway towing on long hauls.

The undercarriage will operate in either direction by pushing a button clearly marked on the steering handle. Control is maintained through electric solenoid switches which are actuated by the push button. Since safe operation is imperative, both sides of the circuit on the motor and solenoids are disconnected when not in use. The steering handle which must be pulled down for operating the undercarriage also controls the master switch and if released returns to upright position opening all circuits. When the handle is pulled down the operator selects and pushes the button for the desired direction. Travel stops when the button is released. Welding machine controls can be set at maximum or minimum and in no way effect operation of the undercarriage. *Ellingsworth Products Company. Louisville 4. Ky.*



Hydraulic Jack and Puller

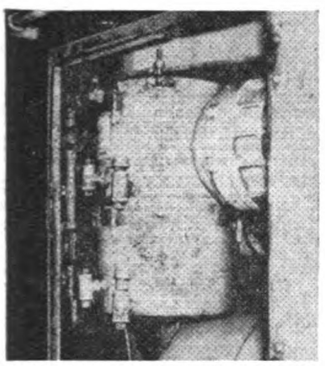
Designed for heavy duty jobs, this hydraulic jack and puller is equipped with a separate motor-powered pumping unit. The jack's hydraulic ram can be both raised and lowered by power to permit faster retraction so that the ram may be positioned more quickly.

Called the Model RP798CO-6010 Re-Mo-Trol, the jack has a 10 in. travel. The ram is equipped with a center hole which permits pulling without the necessity for

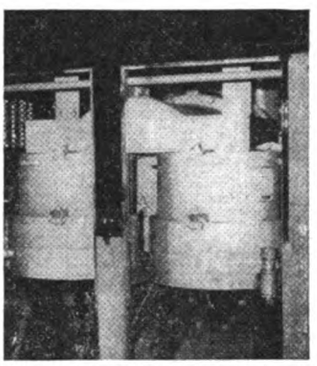
(Continued on page 100)

Two of the hundreds of AIR-MAZE oil bath diesel filter installations that...

OPERATE UP TO 24 TIMES LONGER WITHOUT SERVICE—PAY FOR THEMSELVES IN A YEAR!



ILLINOIS CENTRAL. An oil bath filter on ELECTROMOTIVE 1200 horsepower switcher.



CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC. A 2 unit, manifolded oil bath filter, in use on ALCO 1000 horsepower locomotive—typical switcher application.

TWENTY-TWO RAILROADS now have Air-Maze oil bath filters on the air intakes of hundreds of diesels for freight, passenger and switching service. Result: reduced servicing costs, less diesel engine wear and turbo-charger maintenance. Reports indicate that savings from Air-Maze oil bath filters equal their cost in only one year!

In areas where airborne dirt concentrations are heavy, ordinary filters must be cleaned as often as twice a week. By contrast, Air-Maze oil bath filters go at least three months without changing oil! That's 24 times longer without service! Air-Maze oil bath filters cut engine overhaul costs by scrubbing intake air clean in a bath of oil. Abrasive dust and dirt can't get through to wear out rings, ring grooves and liners. And because there's less build-up on the turbo vanes, these filters also reduce turbo-charger maintenance. Turbo wheels stay in balance, bearings last longer.

Some day all diesel locomotives will have oil bath filtration. Over 98% of all internal combustion engines in use today are protected by oil bath filters. Air-Maze oil bath filters are effective at all engine speeds—do not depend on high air velocity. They work effectively at low pressure loss. And they are not affected by humidity or oil mist conditions. For further information on how Air-Maze oil bath filters can help cut your diesel locomotive filtering costs, call on us or see your locomotive builder. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
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Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1200	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
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Alco-GE	1500-1600	Rd. Freight			

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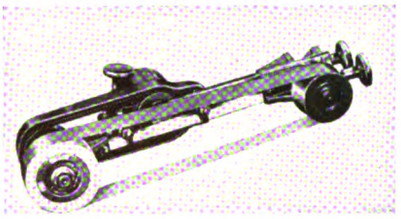
(Continued from page 96)

using elaborate back-up devices to eliminate off-center torque. Connected to the pumping unit by flexible hydraulic hose, the ram can be remotely located for greater operator safety in cramped quarters.

The pump which is powered by a ½-hp universal motor, may be operated by 115 volt a-c or d-c. It can be started or stopped ithout losing travel of the ram.

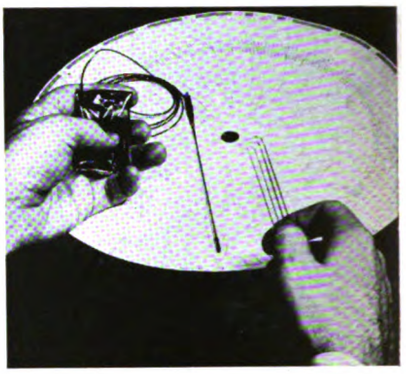
The 60-ton ram is also available with a remote hydraulic hand pump instead of the motorized unit. This model features automatic two-speed changeover on the pump. *Templeton, Kenly & Co., 2525 Gardner Road, Broadview, Ill.*



Contact Wheel Belt Grinder

This belt grinder, Model 500, is said to increase production 20 per cent or more over old grinding operations. It speeds up production on deburring, chamfering, removing flash, fine, parting lines, etc. The unit can be mounted on a bench, pillar, portable table or most any convenient place in the shop. An adjustment of 360 deg vertically is part of its design.

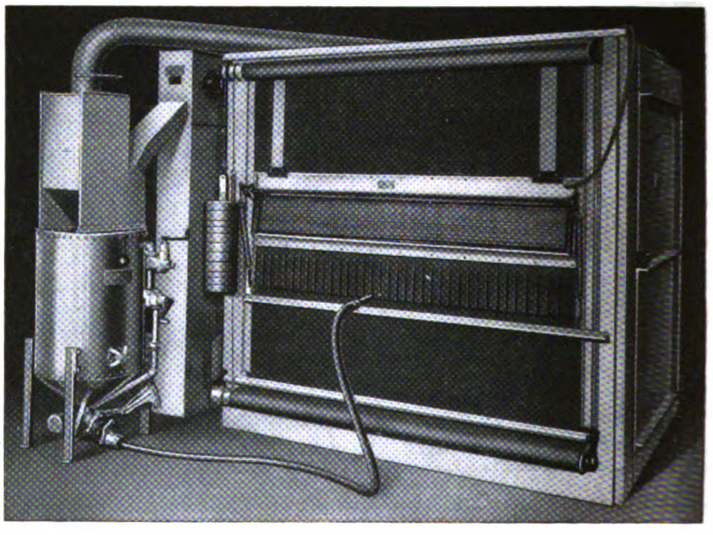
It was designed for use in machine shops, structural shops, foundries, pattern shops, molding shops, etc., where free-hand grinding is performed. The unit is useful for finishing steel, cast iron, bronze, aluminum, wood and plastics. *B & E Manufacturing Co., Inc., 407 Liberty street, Kansas City, Mo.*



Instrument Recording Pen

This featherweight, stainless steel capillary pen is fed from a clear, hermetically-sealed sac containing over a year's supply of

(Continued on page 112)



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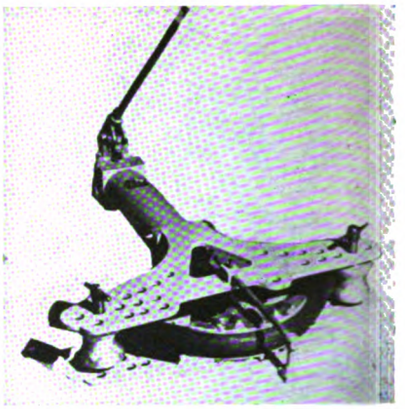
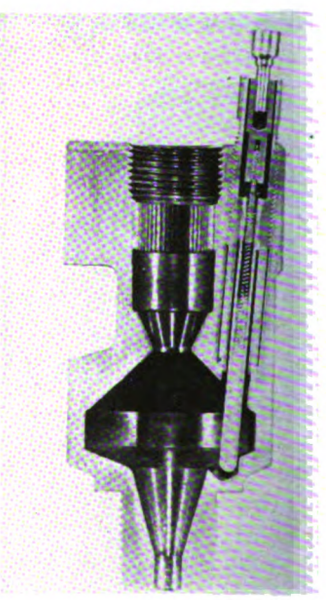


As a pipe bender

job. The manufacturer has equipped its standard pipe bender with a frame, which permits bending pipe, rigid conduit, thin-wall conduit, hard and soft copper, aluminum and steel and any other tubing in 90- and 180-deg segments. *Tal Bender, Inc., Milwaukee 2.*



Diesel Engine Tubular Heater

Product of long research, this tubular heater for diesel engines was designed for quick starting in sub-zero weather. It will enable an operator to start a diesel engine under all weather conditions.

A component part of the diesel engine, the heater is about the size of a pencil and is installed into the engine's precombustion chamber. When the engine is cranked, power is transmitted to the heater which, in 30 sec, reaches a temperature of 1800 deg F. This extreme heat materially increases temperature in the precombustion chamber, thus assisting in igniting the fuel as it is injected into the chamber. *Industrial Heating Department, General Electric Company, Pittsfield, Mass.*

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(*Continued from page 100*)

plastic ink. It is said to save operating dollars by speeding data interpretation and relieving skilled personnel of monotonous duties.

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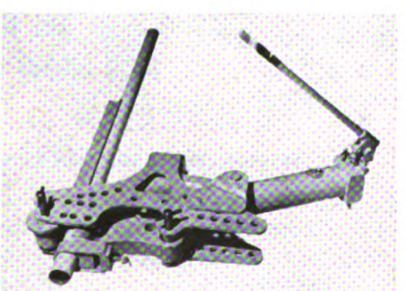

As a tube bender

Pipe and Tube Bender

This portable hydraulic tool eliminates the need for different kinds of benders on a

Founded in 1832

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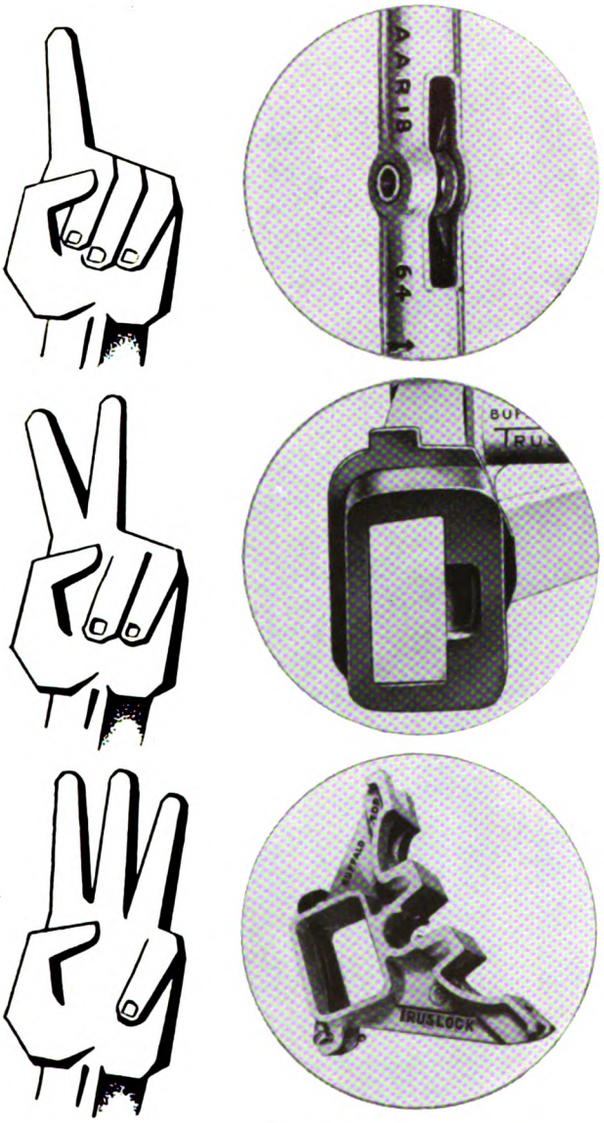

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As the majority of strut troubles were due to worn pin holes—Truslock put a bushing in the pin hole for easy replacement. What was once a reclamation job is now a simple on-the-job replacement with Truslock.

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

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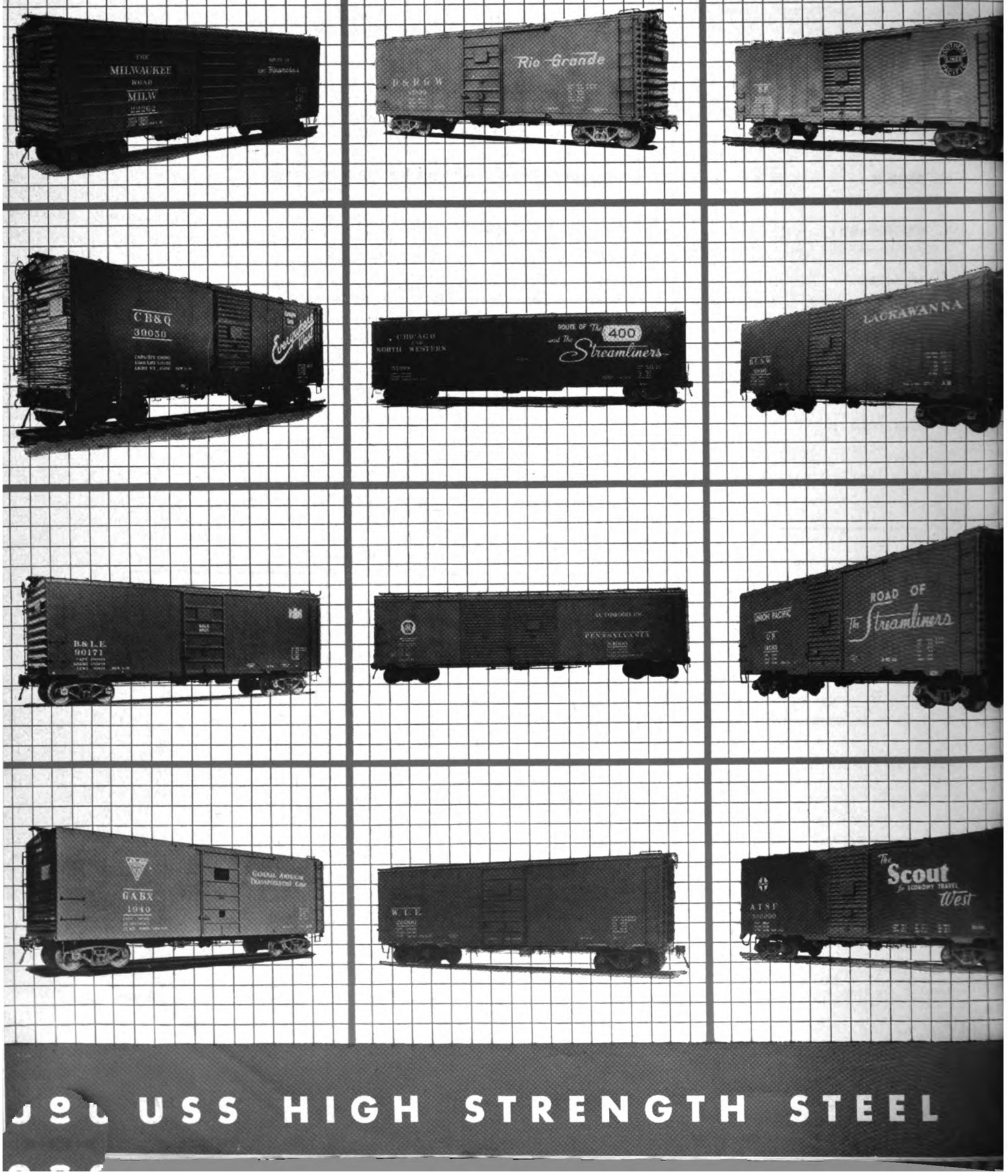
85,000 box cars have been built *better*



USS HIGH STRENGTH STEEL

with USS COR-TEN Steel since 1933

These box cars have carried more payload

- **have cost less to operate**
- **have cost less for maintenance**
- **have proved their ability to outlast other construction**

AT THE PRESENT TIME, more than 33,000 box cars built with USS COR-TEN Steel have been in service for ten years or longer. During that period they have thoroughly demonstrated two things. First, that the economies they make possible outweigh, by far, the slight extra cost of COR-TEN Steel construction. And, second, they have shown that reasonable weight reduction with COR-TEN Steel does not involve any reduction in stamina, life or serviceability.

These facts have not been overlooked by the railroad industry. For it is on the basis of *proved superior performance,* that those railroads which lead in ownership of COR-TEN-built equipment, have through the years added more and more of such cars to their lines.

Take the Southern Pacific for example. This railroad commenced using COR-TEN Steel in 1946. Now has 20,350 box and auto-box cars using COR-TEN in service —enough to make a train 176 miles long. Most of these cars were ordered after the original equipment had proved the merits of COR-TEN Steel construction.

The Union Pacific is another long-time user of COR-TEN Steel box cars. Since 1937 when the first order was placed, fourteen successive orders have brought the total of COR-TEN Steel box cars in U.P. service to 17,080, many of them built in their own shops.

The Milwaukee Road has used COR-TEN Steel in 14,060 box cars built from 1936 to 1949. The C.B.&Q. has used COR-TEN Steel in 10,700 box cars, the Great Northern in 5500, and the Pennsylvania in 2600.

Also enjoying the economic benefits of COR-TEN Steel construction are the Rio Grande, the Santa Fe, the Chicago and North Western, the Lackawanna, and other leading roads which, like all operators of freight equipment, are careful to invest their dollars where they know they will get the biggest return on their money.

We can think of no better reason than this for suggesting that you too investigate the *cost-reducing and revenue-increasing* advantages of USS COR-TEN Steel construction. We will be glad to discuss this matter with you anytime at your convenience.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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USS HIGH STRENGTH STEELS
UNITED STATES STEEL
TWENTY YEARS OF PERFORMANCE

See THE UNITED STATES STEEL HOUR. Televised alternate weeks. Consult your newspaper for time and station.

UNITED STATES STEEL

NEWS

SP Gets New Research Department

Increased research activities of the Southern Pacific are now coordinated under a newly created Department of Research and Mechanical Standards, headquarters at the railroad's general offices in San Francisco, with field laboratories at Sacramento, Roseville, Ogden. Los Angeles and El Paso. The new department is headed by P. V. Garin, formerly engineer of tests, and is part of the motive power department, headed by B. M. Brown, under Vice-President J. W. Corbett (operations).

The enlarged Sacramento laboratory staff now totals 22 persons. Facilities there have been modernized so the laboratory can serve more efficiently as the center for chemical and physical analyses and material inspection and testing for all SP lines west of El Paso, and also for certain tests done for Pacific Fruit Express Company, jointly owned by SP and Union Pacific. Laboratories at other points are mostly concerned with testing of diesel locomotive parts, fuels and lubrication.

Also under jurisdiction of the new department are a number of research projects, some of which are being handled with help of the Stanford Research Institute, of which SP is an associate member. Currently under way are projects to develop a cushioning coupler for freight cars, more effective sanding devices for locomotives, better consumption of heavier fuel oil, improved fire protection for cotton shipments, and stronger shipping containers. A transparent box car has been built for visual study of various methods of tying down loads for safe movement Laboratory work and research are closely coordinated with similar work carried on by the Association of American Railroads.

The functions and duties of the Sacramento laboratory cover a wide field, from routine inspection of purchased and company-manufactured or processed material, to applied research and development on projects necessary to the safe and efficient operations of the shops, locomotives and cars. The laboratory contributes to improvement and safety of railroad operation by conducting investigations into cause of defective tools and parts, and advises as to preventive changes in materials, designs, processes and practices. A recent addition includes equipment for gamma ray and ultrasonic testing.

One function of the department is to test car wheels manufactured in Sacramento shops to be sure they meet AAR specifications. Last year 52,169 chilled cast-iron car wheels turned out by the wheel foundry passed this rigid inspection. Also laboratory-controlled during the year were 193,000 freight-car journal bearings turned out by the railroad's Sacramento brass foundry. Chemical analysis check was made on many thousands of pounds of other brass products, and on approximately 650,000 lb of anti-friction alloys

The Sacramento oil laboratory, equipped with a spectrograph, serves as control station for districts not served by other established diesel control laboratories of the railroad. Diesel crank-case oil and radiator cooling water are sent here for checking. Analysis of oil and water can disclose how an engine is functioning and wearing, and can indicate when over-hauls should be made in order to avoid a breakdown in service. Considerable research is done on greases.

A process for reclaiming journal-box oil was worked out at the laboratory, and reclamation of various other oils is carefully controlled by laboratory tests. The tests of so-called economy type fuels have been carried on in close cooperation between the Research Department personnel and the other departments of the railroad.

Among the testing devices at the laboratory is a weather-ometer, which can test the wearing ability of paints by subjecting them to years of weathering in a comparatively short time.

Many of the functions of this laboratory are also performed in other field laboratories, which in each case are housed adjoining the shops where diesel locomotives are serviced. This allows the tests

(Continued on page 10)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of January 1955	1954
3	Road locomotive miles (000) (M-211):		
3-05	Total, steam	4,803	7,883
3-06	Total, Diesel-electric	34,258	31,265
3-07	Total, electric	697	623
3-04	Total, locomotive-miles	39,972	39,841
4	Car-miles (000,000) (M-211):		
4-03	Loaded, total	1,536	1,474
4-06	Empty, total	911	867
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):		
6-01	Total in coal-burning steam locomotive trains	10,539	14,967
6-02	Total in oil-burning steam locomotive trains	1,239	2,623
6-03	Total in Diesel-electric locomotive trains	94,345	84,725
6-04	Total in electric locomotive trains	2,103	1,842
6-06	Total in all trains	108,934	104,390
10	Averages per train-mile (excluding light trains) (M-211):		
10-01	Locomotive-miles (principal and helper)	1.02	1.02
10-02	Loaded freight car-miles	41.00	39.80
10-03	Empty freight car-miles	24.40	23.40
10-04	Total freight car-miles (excluding caboose)	65.50	63.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,916	2,816
10-06	Net ton-miles	1,289	1,245
12	Net ton-miles per loaded car-mile (M-211)	31.30	31.30
13	Car-mile ratios (M-211):		
13-03	Per cent loaded of total freight car-miles	62.80	63.00
14	Averages per train hour (M-211):		
14-01	Train miles	19.20	18.80
14-02	Gross ton-miles (excluding locomotive and tender)	55,406	52,304
14	Car-miles per freight car day (M-240):		
14-01	Serviceable	43.30	40.70
14-02	All	40.70	38.80
15	Average net ton-miles per freight car-day (M-240)	801	765
17	Per cent of home cars of total freight cars on the line (M-240)	52.80	53.70

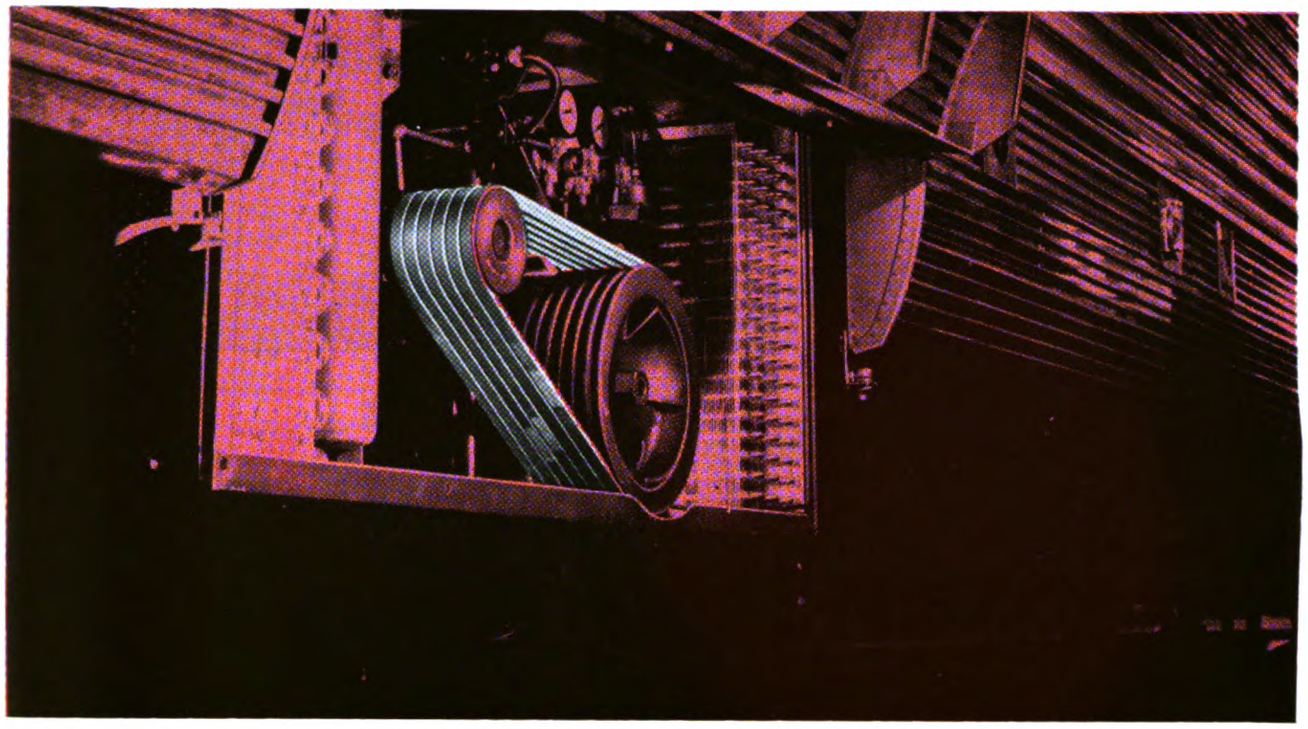
PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):		
3-05	Steam	1,449	2,895
3-06	Diesel-electric	21,272	21,288
3-07	Electric	1,414	1,496
3-04	Total	24,136	25,681
4	Passenger-train car-miles (000):		
4-08	Total in all locomotive-propelled trains	243,606	258,010
4-09	Total in coal-burning steam locomotive trains	8,446	15,200
4-10	Total in oil-burning steam locomotive trains	3,861	8,997
4-11	Total in Diesel-electric locomotive trains	215,153	217,150
12	Total car-miles per train-miles	9.73	9.70

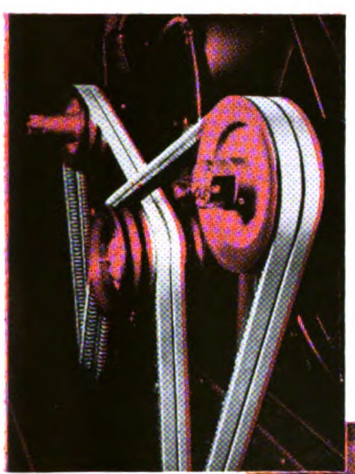
YARD SERVICE DATA FROM I.C.C. M-215

1	Freight yard switching locomotive-hours (000):		
1-01	Steam, coal-burning	239	373
1-02	Steam, oil-burning	41	53
1-03	Diesel-electric[1]	3,433	3,321
1-06	Total	3,722	3,759
2	Passenger yard switching hours (000):		
2-01	Steam, coal-burning	9	14
2-02	Steam, oil-burning	4	4
2-03	Diesel-electric[1]	257	268
2-06	Total	298	317
3	Hours per yard locomotive-day:		
3-01	Steam	4.40	4.90
3-02	Diesel-electric	15.00	15.00
3-05	Serviceable	14.70	14.10
3-06	All locomotives (serviceable, unserviceable and stored)	12.70	12.20
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.68	1.77
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.76	0.76

[1]Excludes B and trailing A units.

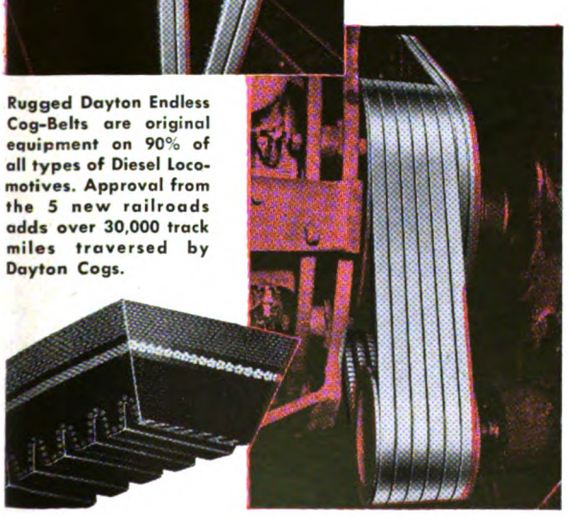


More Railroads Standardize 100% on Dayton Cog-Belts* Every Year



At left.
Radiator Fan and Blower Drive. Dayton V-Belts are ruggedly constructed of specially processed materials to withstand grueling punishment.

Below.
Auxiliary Generator Drive employing six powerful Dayton Cog-Belts.



Rugged Dayton Endless Cog-Belts are original equipment on 90% of all types of Diesel Locomotives. Approval from the 5 new railroads adds over 30,000 track miles traversed by Dayton Cogs.

Five more Major Railroads approve Dayton Endless Cog-Belts for Diesel Locomotives and Air-Conditioning drives

The reason Dayton Cog-Belts are being approved by Mechanical and Electrical Engineers everywhere is because they solve a basic and ever-present problem — the need for continuous, dependable power. Power for diesel drives — for blowers, auxiliaries and engine drives. Power for unfailing air-conditioning drives. Power for *every* conceivable application.

Here are more reasons: Dayton Endless Cog-Belts are especially designed for Railway service — oil proof, heat resistant, low stretch, high flexibility. Dayton Endless Cog-Belts are furnished in all of the special lengths that are required for diesel and air conditioning applications.

Dayton Engineers will gladly work with you to help you turn your V-drive problems into improved service, greater passenger comfort, at lower operating costs. Get the money-saving facts on longer lasting Dayton Endless Cog-Belts right away. Direct your request to Dayton Rubber Co., Railway Division, Dept. 203, Dayton 1, Ohio.

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GOLDEN JUBILEE
Dayton Rubber
50 YEARS OF PROGRESS
World's Largest Manufacturer of V-Belts

THE NEW "TUBULAR TRAIN" just ordered by the Pennsylvania from the Budd Company (see footnote 14 to table of Orders and Inquiries for New Equipment on page 11) will weigh approximately 40% less, have a lower center of gravity, and be almost two feet lower in overall height, than a conventional train. The seven passenger-carrying cars, plus a power car, will be, in effect, steel tubes, with the car structures doing the work of conventional steel underframes.

SP Research Dept.

(Continued from page 6)

to be promptly made on arrival of locomotives at terminal. They are serving to check on diesel-engine condition so service and over-hauls can be done more effectively and road failures prevented, President Russell explained.

Atomic Locomotive Study Authorized

A contract for a study of a new nuclear-power reciprocating engine for locomotive propulsion was signed in Washington, D.C., March 24.

Admiral Lewis L. Strauss, chairman of the Atomic Energy Commission, made the announcement, while the contract itself was signed by James F. Connaughton, vice-president of the Baldwin-Lima-Hamilton Corporation, and Joseph L. Henning, Washington representative of the Denver & Rio Grande Western.

Under terms of the study agreement, the road and manufacturer will investigate engineering, technical and economic aspects of building and operating a nuclear-powered reciprocating engine for locomotives. The two companies will finance the study and will have at their disposal information developed by the AEC which may be applied to their research, in addition to consultation and assistance from AEC personnel as needed.

An AEC spokesman emphasized that there is not now any such locomotive engine under construction and said the D&RGW-BLH project does not involve building one. The study is scheduled to run for one year at the end of which time a report will be made to the AEC with recommendations for future work.

Heads of the two companies which will cooperate in the study said:

Wilson McCarthy, president, D&RGW: —"We believe the study project authorized by the Atomic Energy Commission presages a new concept of the utilization of atomic power for railroads. The basic principle

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE APRIL ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Central of Georgia	6[1]	1,750	Road switching	Electro-Motive
Chicago & Illinois Midland	2[2]	1,200	Switching	Electro-Motive
New York Central	1[3]	1,000	Passenger	Baldwin-Lima-Hamilton
New York, Chicago & St. Louis	32[4]	1,750	Road switching	Electro-Motive
New York, New Haven & Hartford	2[3]	1,000	Passenger	Baldwin-Lima-Hamilton
	2	....	Passenger	Electro-Motive
Union Pacific	30	2,400	Passenger	Electro-Motive
	20	1,000	Switching	American Locomotive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
American Refrigerator Transit Co.	100[5]	70-ton insulated box	Pacific Car & Fdry.
	40	40-ton insulated box	Pacific Car & Fdry.
Chesapeake & Ohio	500[5a]	Box	Pullman-Standard
Chicago & North Western	25[6]	Caboose	International Ry. Car
Chicago Great Western	10	Caboose	International Ry. Car
Missouri-Kansas-Texas	25[6]	70-ton gondola	Bethlehem Steel Co.
Monongahela Connecting	75	Gondola	Greenville Steel Car
North American Car Corp.	8[7]	70-ton covered hopper	Pullman-Standard
Pennsylvania	200[8]	Flat	Company shops
Pittsburgh & West Virginia	50[9]	70-ton covered hopper	Pullman-Standard
Reserve Mining Co.	4	Caboose	International Ry. Car
Southern	50	50-ton box	Pullman-Standard
Union Tank Car Co.	5	Tank	Company Shops
	400	11,000 gal. tank	Company shops
	100	8,000 gal. tank	Company shops
	301	10,000 gal. tank	Company shops
Union Pacific	300[10]	50-ton box	Company shops
	100	Cabooses	Company shops
	300	Stock	Company shops
	300	Flat	Company shops
Wabash	300[11]	50-ton box	General American Trans.
Western Pacific	250[12]	Box	Pullman-Standard
	50	Flat	Pullman-Standard
	20	Special insulated box	Pullman-Standard

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	35[13]	Chair	Budd Co.
	6	Diners	Budd Co.
	6	Dome-lounge	Budd Co.
New York Central	See footnote 3.		Pullman-Standard
New York, New Haven & Hartford	See footnote 3.		Pullman-Standard ACF Industries
Pennsylvania	See footnote 14.		Budd Co.

[1] To have been delivered in April. Estimated unit price, $196,037.

[2] To have been delivered in April.

3 Equipment for the New York Central and the New Haven for "revolutionary low-center-of-gravity passenger trains" which will weigh and cost "about a third as much as present so-called lightweight equipment." The NYC, according to the announcement made by the two roads upon the signing of orders, has advised General Motors Corporation that the railroad will take the first of GM's new lightweight train, including motive power, "when and if this train becomes available." According to present plans the announcement sail, the GM train "will be tested on the New Haven late this year."

Alfred E. Perlman, NYC president, addressing a March 29 luncheon meeting of the Traffic Club of New York, said the road is buying and will try out a diesel-hydraulic locomotive built in Germany.

The Baldwin-built locomotives for the new trains will weigh about 135,000 lb each, will be 11 ft high and 46 ft long, the announcement said. One will be at each end of the New Haven train, enabling it to operate in either direction without having to turn. Power for the locomotives will be provided by a 1,000-hp, 12-cylinder diesel engine mounted on a two-axle driving truck and delivering its power through a four-speed torque converter transmission.

One 400-hp six-cylinder unit will provide light, heat and air-conditioning for the entire train.

"The principle of packaged maintenance, rather than progressive maintenance, will be utilized," the announcement added. "After operating for several hundred thousand miles, the power units can be easily replaced and the locomotive can be quickly returned to service."

A spokesman for Baldwin-Lima-Hamilton said "certain parts of the engines may be furnished by a German manufacturer."

The equipment ordered by the New Haven from ACF and Electro-Motive Division is in addition to the equipment which the New Haven is buying from the Pullman-Standard Car Manufacturing Company and Baldwin-Lima-Hamilton.

Over 400 passengers will be accommodated in this second "Talgo" train. Its five coaches, each of which will consist of three articulated units, will be powered by two 1,200-hp diesel locomotives, with an extra "transition car" for third-rail electric operation into Grand Central Treminal in New York. To facilitate quick turnaround, the train will have a locomotive at each end, manufactured by the Electro-Motive Division of General Motors Corporation.

The entirely new "Talgo" train is the product of research in the United States and experience in Spain.

and has all the latest technical advances which ACF engineers have developed since the original "Talgo" was completed in 1949. That train was the demonstrator which was tried out on the main line of New Haven last summer.

Advantages of the new "Talgo" are said to be "strength, improved riding qualities, easy coupling and uncoupling, complete reversibility, and high average speeds." The train will weigh, per passenger, about half of the average streamliner in use today. Center of gravity will be about two feet lower than conventional equipment, and the floor will be only 26 in. above the rails, compared with 54 in. on standard trains.

[4] Delivery scheduled for June and July. Estimated cost, $5,119,487.

[5] Delivery schedule for August. Estimated unit cost of the 70-ton cars, $13,800; of the 40-ton cars. $12,200.

[5a] To cost $5,750,000. To be equipped with special devices for more efficient loading and to prevent damage to lading.

[6] For delivery this month.

[7] To have been delivered in April. Approximate unit cost, $8,800.

[8] For "TrucTrain" piggyback service. Delivery to begin late this month. The road also has authorized the complete rebuilding and modernization in its Altoona shops of 2,000 box cars. The latter, to have special steel flooring, will start going into service in June.

[9] To have been delivered in April. Cost, $370,000.

[10] First to be built will be 100 50-ton insulated box cars, to be followed by 100 cabooses, 200 50-ton box cars with 15-ft doorways, 300 stock cars with metal slats, and 300 50-ton flat cars. All are scheduled for completion this year. Underframes for the insulated box cars, the 200 wide-door box cars, and the cabooses, as well as underframes and other components for the stock cars, are being furnished by the International Steel Company.

[11] Delivery scheduled during this month. Fifty cars are for a subsidiary, the New Jersey. Indiana & Illinois.

[12] The box car order includes 50 cars with 8-ft doors, 100 double-door cars and 100 double-door cars equipped with Evans automobile loading devices. Twenty of the flat cars will have special bulkheads and hold-down devices for plasterboard loading; four will have hold-down and deck devices for loading automobile frames; and 10 will have hold-down devices for possible use in piggyback service. All the flats will be equipped with roller bearings.

According to Pullman-Standard, the WP will become the first railroad to introduce a 50-ft insulated box car equipped with compartmentizer gates when it takes delivery of these 20 cars next summer. The cars will have refrigerator-type flush doors, and will permit shipment of canned goods in even temperature ranges both summer and winter. The compartmentizer gates will provide protection against losses caused by impacts or shifts in lading.

In addition to the revenue cars, WP directors on March 15 approved purchase of 35 new bay window cabooses costing $525,000. They will be equipped with electric lights and radio.

[13] For re-equipping the "El Capitan," an all chair-car train. By mid-1956, the Chicago-Los Angeles streamliner will then have new "hi-level" coaches, dining cars and dome-lounge cars. The cars are a move in the other direction from the so-called low-slung trains ordered by four other railroads—the Rock Island, the Pennsylvania, the New Haven and the New York Central. Decision to order the new cars was based, according to Santa Fe President Fred G. Gurley, on "favorable public acceptance" of the two experimental units which have been in service since the middle of 1954.

The new cars will be 15½ ft high or 2 ft higher than conventional equipment. Passengers will have a view through spacious windows from reclining seats 8 ft above the rails, or 4 ft higher than the floor of a regular chair car. The extra elevation is said to provide a smoother and more enjoyable ride with less noise and vibration.

The double-level arrangement, which eliminates vestibules, will provide 28 more seats for passengers in each chair car as compared with cars on the present "El Capitan." The new train will have a capacity in its seven chair cars of 496 passengers, compared with the present "El Capitan's" normal capacity of 350 persons in eight cars.

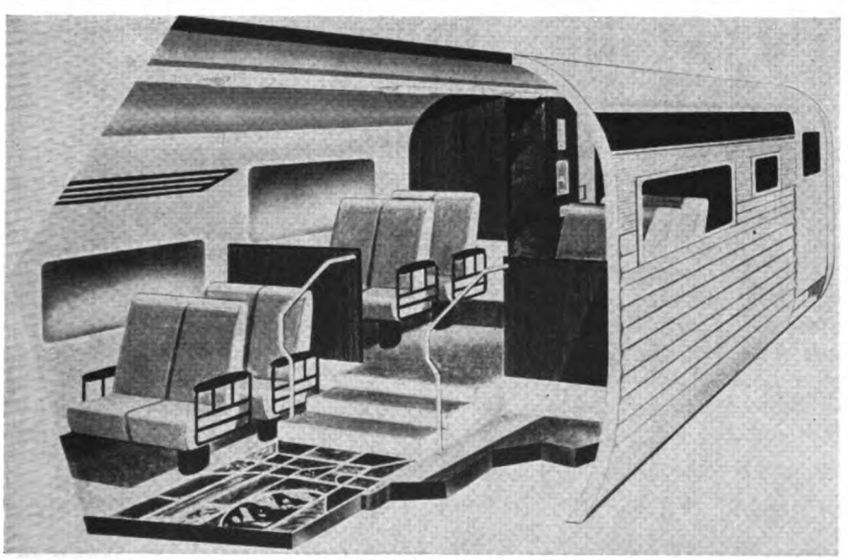
Doors are located at centers of all cars on both sides. Passengers entering chair cars will step directly in from platform level.

Luggage placed on shelves on the lower level will be unloaded at stations through separate openings in sides of cars, leaving vestibules clear to facilitate detraining and entraining of passengers.

Upper levels of dining cars will be devoted entirely to table space for 80 diners, with a kitchen located on the lower deck from which food will be transported to the top level by two elevators.

Dome-type lounge cars, seating a total of 88 patrons on upper and lower decks, will have dome windows the full length of the car on the upper deck, with picture windows 56 in. wide on the lower deck. There will also be a newsstand, a refreshment bar and rest rooms.

[14] For the new passenger train of tubular design recently announced by the Pennsylvania (see Proposed Designs of Passenger Equipment," page 6, April issue). The train, to be built of stainless steel, will accommodate 574 passengers and will cost somewhat over $1,000,000. This will be a cut of about 25 per cent per seat compared with coaches built only three years ago, according to James M. Symes, president of the road. Quantity production later may make possible further cost reductions. Riding on four-wheel trucks under each end, the new cars will be only 11¾ ft in height, almost 2 ft lower than existing coaches. Although each will be as long as present cars, 85 ft, weight will be only 77,000 lb, a reduction of approximately 40 per cent.



A TWO-LEVEL FLOOR arrangement will help to achieve a low center of gravity while contributing to a feeling of interior spaciousness in the "tubular train" to be delivered to the Pennsylvania next year. Reclining seats will be available on both levels, with lounge chairs in a smoking area at one end of each car. Lavatories will be at the far end, as shown in this artist's conception of the interior of one of the seven cars in the train.

on which it rests is the result of a 15-month study by Ray McBrian, Rio Grande engineer of standards and research, working closely with research engineers of Baldwin-Lima-Hamilton. That AEC has authorized us to proceed with this study is a source of great satisfaction to us."

George A. Rentschler, chairman of the board, Baldwin-Lima-Hamilton Corporation: —"It is in the best tradition of our nation that two American companies together have spent almost a year and a half developing this study proposal. Now, with the signing of the contract with AEC, we and the D&RGW will go forward on this study project which could well open the road to a new era in railroading. I pay special tribute to Fred Geitman and John Newton, our engineers, and to Ray McBrian, the D&RGW engineer, for their fine work."

Steam Locomotive Research Scholarships Are Available

Applications are being accepted from sons of railroad families for the Steam Locomotive Research Institute scholarships at the Stevens Institute of Technology. Candidates must have the necessary scholastic qualifications for admission to Stevens, then must prove their need for financial assistance. The scholarships were established in September 1952 with funds remaining after dissolution of the research institute.

Any Old Railway Ages?

Watch for surprise announcement about prizes for finders of the oldest copies of affiliated *Railway Age*, the weekly which is soon to celebrate 100 years of continuous publication.

Look also for titles *Railroad Gazette* (before 1908) and *Western Railroad Gazette* (before 1870).

There may be gold in that odd corner.

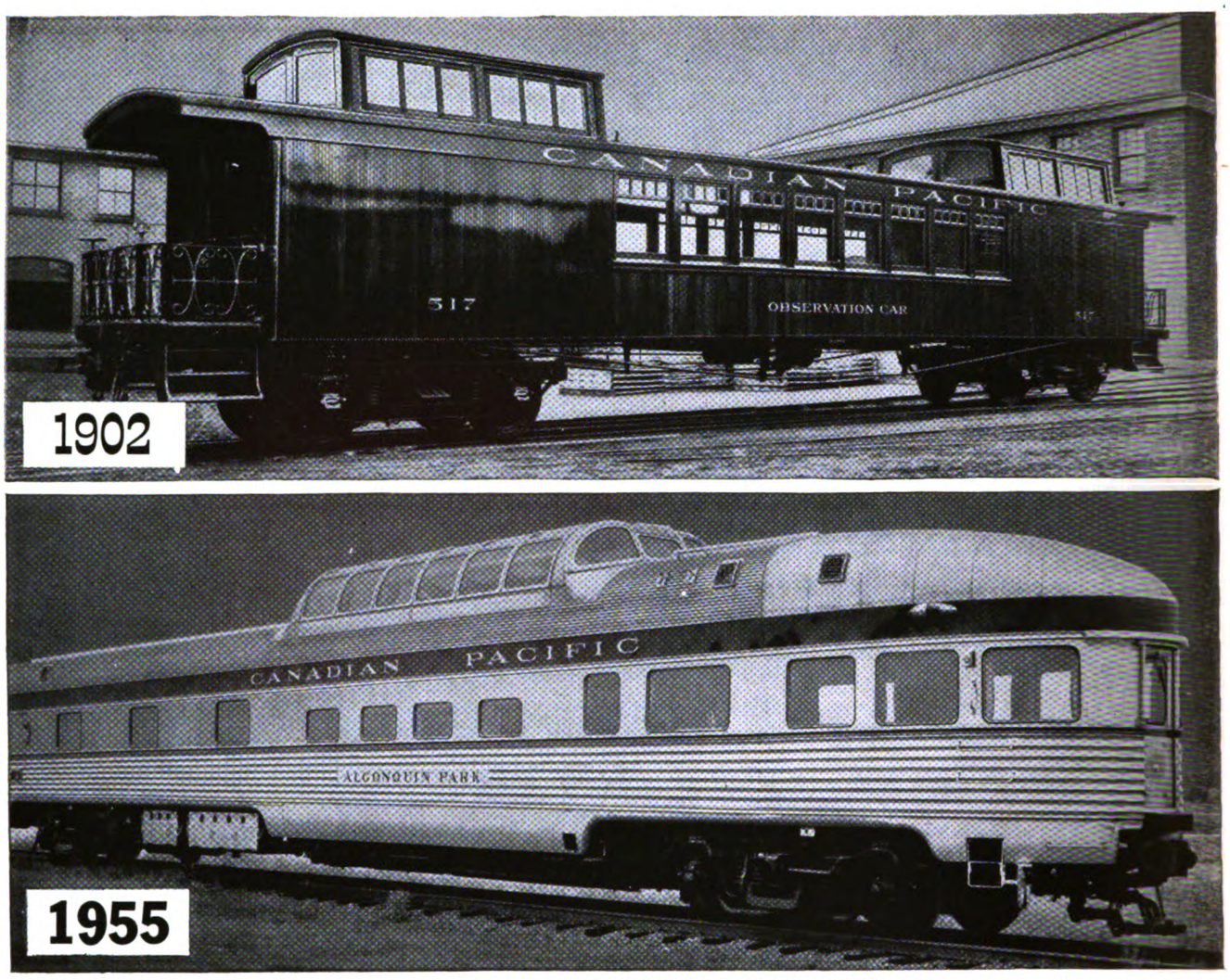
P. F. E. Steps Up Its Safety Efforts

By intensive efforts in accident prevention, the Pacific Fruit Express Company under the leadership of K. V. Plummer, vice-president and general manager, has achieved an outstanding cooperative result in the last few years. This is shown by the reduction in casualties per million man-hours worked from about 34 in 1947 to 22 in 1948, 13 in 1949 and then more slowly to a record low of 3.11 in 1954.

A clearer picture of what has been accomplished is afforded by consideration of the widespread nature of P.F.E. activities which include work in 7 off-line districts, 3 districts in platforms, 17 in plants, 6 major car repair shops, 3 light repair stations, six material stores, construction forces, etc. The official record shows a total of 41 reportable injuries in 13,176,488 man-hours worked during 1954 which gives the figure 3.11 casualties per million man hours as mentioned.

In recognition of especially meritorious efforts in accident prevention, Pacific Fruit Express officers have recently visited all major P.F.E. points and awarded safety plaques to the various departments which

(Continued on page 94)



Practical and popular. Car No. 517 was an immediate success when put into service by the Canadian Pacific Railway in 1902. The road is adding 36 sleekly beautiful stainless steel dome cars to its fleet. The Budd Company of Philadelphia, Pa., has produced over 2250 all-stainless steel passenger cars, including scenic dome types.

How "new" is the Scenic Dome car?

Not quite so new as you might think! Some long-forgotten genius—probably inspired by the cupola carried on cabooses — conceived the scenic dome passenger car about 1900.

The first model was an elegant creation of solid mahogany and gold leaf. But compare it with today's deluxe streamliner, built of chromium-nickel stainless steel.

Old No. 517 rolled out of the Canadian Pacific shop in 1902 — it had to be scrapped in 1913, after a life of only 11 years. By contrast, modern all-stainless steel passenger cars have given over 20 years of daily service and still show no signs of deterioration.

The high strength-weight ratio of properly designed cars of nickel-bearing stainless steel permits substantial reductions of bulk and deadweight — *without any sacrifice of strength or safety*. What's more, stainless steel containing nickel effectively resists the corrosive conditions met in everyday railroading.

The use of nickel-bearing stainless steel in railway cars is just one more proof of the value of nickel as an alloying agent. In general, nickel strengthens and toughens other metals and imparts to them added corrosion-resistance.

If you have a problem in which corrosion, high or low temperatures, stresses or fatigue are troublesome factors, let's talk it over. Two minds are always better than one, and we may be able to help you find out how nickel or a nickel alloy can solve a troublesome problem for you.

Write for . . . List A of available publications. A simple form makes it easy for you to outline your problem.

INCO TRADE MARK

Nickel Alloys Perform Better Longer

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

● There were three points in manufacturing history when designers could have demanded 24-carat gold for bearings. It happened once during World War I, when the Liberty Engine was born. Again when the Luftwaffe became the scourge of World War II skies. It happened when Rolls Royce built their Bentley automobile for millionaires.

What did these designers use when they could have demanded anything? ALUMINUM. And because of their early conviction that aluminum was the finest bearing material obtainable, scores of companies today are switching to solid aluminum bearings.

What do they get from aluminum that neither babbitt nor bronze nor any multimetalic combination offers? *No bond problems.* One-piece aluminum bearings *take tremendous loads* without failure.

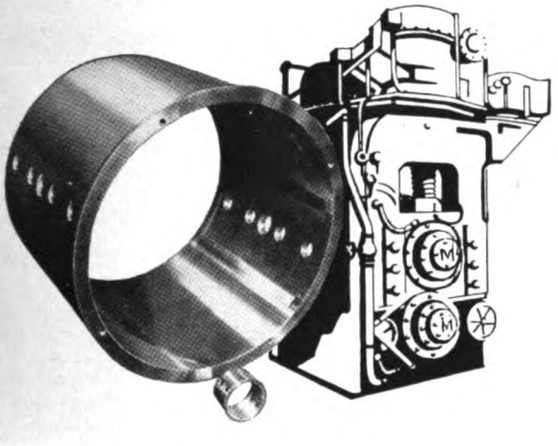
Where additive oils are used, these engineers specify aluminum, knowing its *natural corrosion resistance* protects them. Where hot spots are likely, they know aluminum's *swift thermal conductivity* lessens seizures. Where dirt is a problem, they know aluminum *embeds particles* almost as well as babbitt —far better than bronze.

Who will be next to quadruple the life of his bearings? It could be the man who fills out the coupon below.

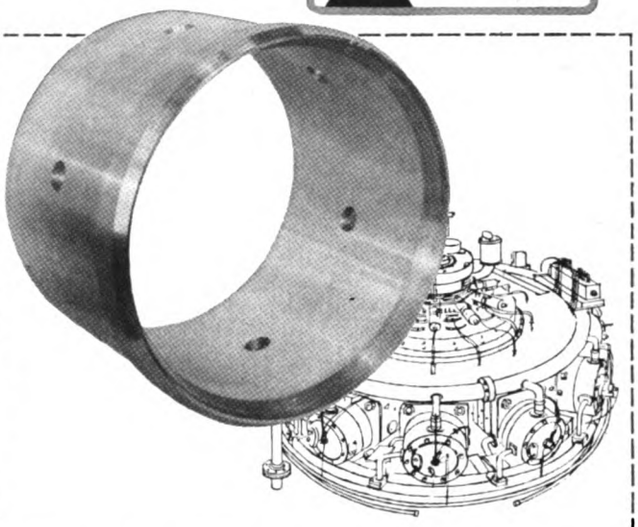
ALUMINUM COMPANY OF AMERICA
1986-E Alcoa Building, Mellon Square, Pittsburgh 19, Pa.
Gentlemen: I would like to discuss aluminum bearings with an Alcoa sales engineer.
Name_____ Title_____
Company_____
Street and Number_____
City_____ Zone____ State____

Your Guide To Aluminum Value

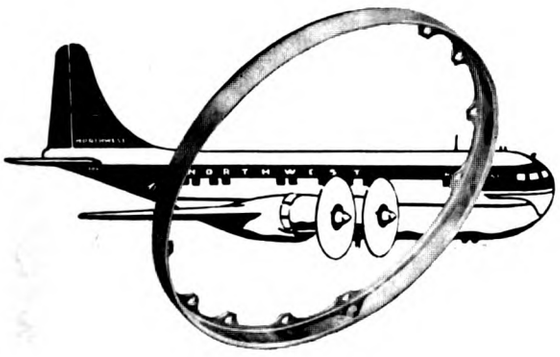
BEARINGS MADE OF ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA



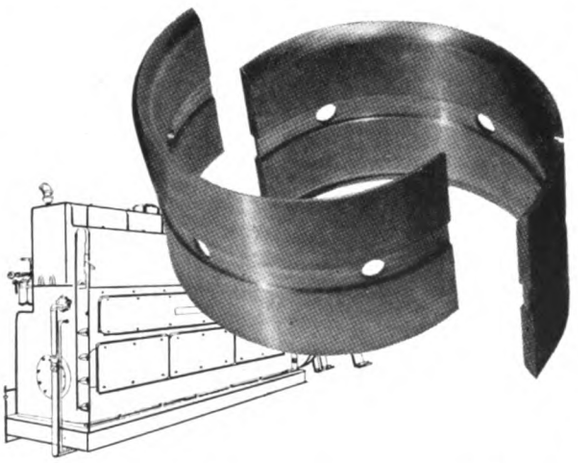
MORGAN CONSTR. CO.—use solid aluminum for their Morgoil Roll Neck Bearings in rolling mills. They report longer life than previously used steel-backed cadmium bearings, better corrosion resistance, better performance at high and low speeds on both hot and cold mills.



NORDBERG MFG. CO.—use full, round, solid bushings of Alcoa® Aluminum. They prove far superior to babbitt—give longer life—lessen maintenance interruption. Over 20,000 operating hours without failure.

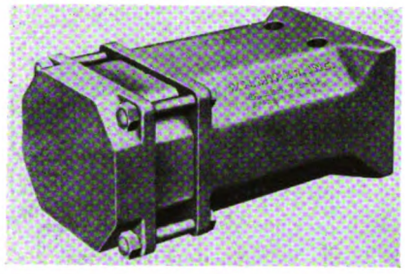


PRATT & WHITNEY—needed a bearing material to withstand the sliding action of steel on their cam bearing. They used a solid aluminum bearing with excellent scuff resistance—saved 65 per cent weight—got better bearing performance.



INGERSOLL-RAND CO.—specified full floating bearings of solid Alcoa Aluminum for main connecting rod and thrust bearings. Results: longer life and lower cost than steel-backed babbitt, no spoiled crankshafts.

EQUIPMENT... *New Ideas—New Uses*

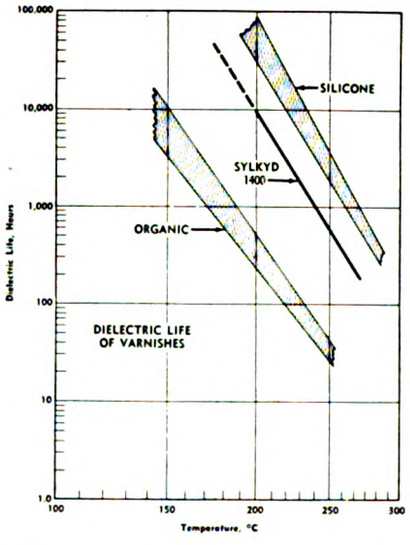


Rubber Draft Gear For Cars and Locomotives

The Miner Class FR-16 rubber draft gear recently awarded AAR Certificate No. 26, is designed with sufficient initial compression to fill the gear pocket or yoke tightly for any plus variations. This initial compression insures permanence of positive initial action, thereby guaranteeing superior durability which is primarily related to tight attachments that will result in reduced wear on coupler carriers and draft keys. The FR-16 incorporating the Miner technique insures a compression action which produces 25 per cent of its total capacity at half travel. Thus, the gear possesses what Miner feels to be the cushioning efficiency of any type draft gear, and that is the gear shall compress with such a rate of increase in resistance as will cause the lowest practical ultimate force in pounds. It is evident that the Miner FR-16 with positive initial action will have much less final load in pounds than a gear which does not possess 25 per cent capacity at half travel.

The FR-16 is designed for application to the 24⅝-in. pocket and utilizes standard draft attachments. The gear is fully enclosed and self-contained. It can, therefore, be applied within the standard yoke and to the car at any railroad shop. Prior to shipment, the gear is reduced in length by the use of aluminum inserts placed underneath the heads of the four bolts, thereby permitting easy application to the draft gear pocket. No special tools or procedures are required to install the device.

AAR laboratory tests showed the gear to have a capacity of 39,400 ft lb at 2¾ in. travel. These results are realized with a maximum reaction of 475,000 lb, which is 10 per cent lower than the 525,000 lb column strength of a Type E coupler. *W. H. Miner, Inc., 209 South La Salle street, Chicago 4.*



Impregnating Varnish

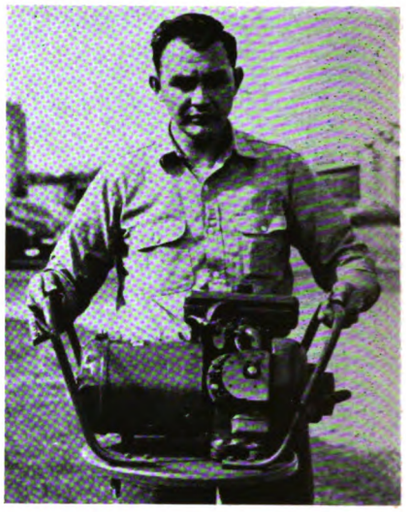
A modified silicone dipping and impregnating varnish, identified as Sylkyd 1400, increases the durability of electrical equipment insulated with Class B components. The formulation combines good heat stability with excellent bond strength and resistance to moisture, oil and solvents.

The manufacturer claims that the product has an insulating life expectancy of 25 to 50 times that of good organic varnishes at the Class B hottest temperature of 130 deg C. Not intended for use at Class H temperatures, it will stand up at temperatures in the range of 180 to 200 deg C for short intervals.

Bond strength at all service temperatures equals or exceeds organic varnishes, and is second only to the most specialized dielectric coatings. These properties make the formulation adaptable to railroad traction motors and other heavy duty equipment which carry frequent overloads and must be periodically cleaned for inspection and performance checking. *Dow Corning Corporation, Midland, Mich.*

Corrosion Inhibitors

Two new types of corrosion inhibitors, CI-103 and CI-104, are effective both on ferrous and non-ferrous metals. Type CI-103 is a film-former which dries tack-free in three to four minutes. It may be removed by a simple aromatic petroleum solvent wash. Type CI-104, neither a coating nor a film-former, leaves an extraordinary durable deposit of mono-molecular dimension as a moisture barrier on treated surfaces. Developed by *Princeton Paint Laboratories* and available from *John B. Moore Corporation, P. O. Box 3, Nutley 10, N. J.*



Portable Generator

This device has been designed to furnish temporary or emergency sources of electric power. It is light in weight, yet it puts out 1,500 watts of electricity, enough to operate small tools, floodlights, electric pumps or other similar electrical equipment.

A 4-cycle, direct-drive, 3-hp gasoline engine runs the generator. It is equipped with an automatic rewind starter and has two built-in sockets. Units for d-c supply weigh 97 lb while a-c units weigh 107 lb. *Master Vibrator Company, 262 Stanley avenue, Dayton, Ohio.*

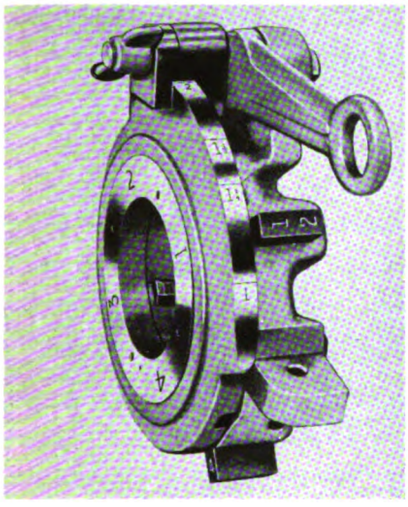
Mineral Shot Blast

Mono-Kleen, a spherical non-metallic mineral shot, cleans uniformly in one pass with no dust clouding the operator's vision and leaving the surface free of grime, film and

dust. It is said to permit substantial savings in production time, material cost, and blasting-equipment maintenance, as compared with sand and metallic shot.

The spherical characteristic of the shot reduces wear on the mixing chambers, hoses and nozzles of the blasting equipment. It requires a lower impact velocity and blasting pressure, therefore, reduced power costs are obtained. The shot can be reclaimed and reprocessed for use again.

The product, containing only 0.1 per cent free silica, constitutes no health hazard. It is chemically inert in the presence of moisture and will not discolor metallic or non-metallic surfaces. It is available in two types: Type S for heavy duty use in foundries and general blast cleaning, and Type F for fine finishing of precision metal parts, glass and other materials. Both are shipped in bulk or in 100 lb multiwall paper bages. *Baldwin-Hill Company, Trenton, N. J.*



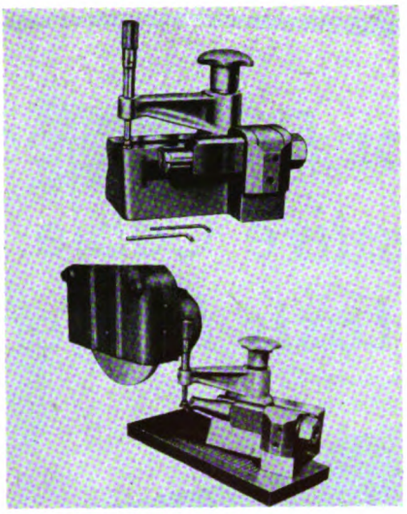
Die Head

When the Quadra-Type die head is set in position it will thread graduation easily and accurately and will not slip. It threads pipe or bolt in 1-, 1¼-, 1½- and 2-in. sizes. Thread after thread can be cut without resetting. The unit is fully adsustable to cut standard, and over or under standard threads.

Die numbers are deeply and clearly marked by a special engraving process. Die set numbers are easily read, even though oil film or dim light. The unit is constructed for long wear and has a quick-opening throw-out. It has die segments 1⅛ in. wide to insure a perfect standard length thread. *Beaver Pipe Tools, Inc., Warren, Ohio.*

Micrometer and Grinding Fixture

A micrometer grinding fixture for setting the proper offset when sharpening circular form tools used in automatic screw machines and recessing tools is designed for



use on any toolroom surface grinder having a magnetic chuck, or for bolting to the table on universal type grinders.

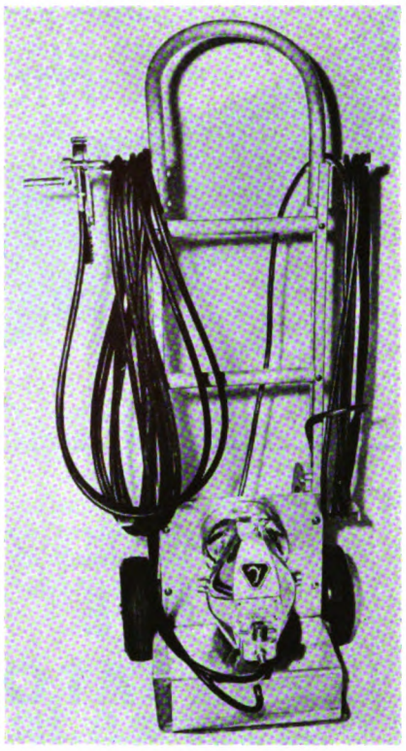
The manufacturer claims that the fixture allows easier setup for grinding and measuring face offset; closer control over tool diameters and angles for accurate work; and consistent reproduction of flat cutting faces, parallel to center line and square with the sides. After sharpening, the cutter may be set in the machine or recessing tool and used without further checking by out-and-try methods.

Interchangeable adapters are available for correct mounting of various type cutters. *Scully-Jones & Co., 1901 South Rockwell street, Chicago 8.*

Rectifier Welder

This welder, equipped with a five-range control switch, provides coarse adjustment with generous overlap between ranges to permit dual control. Its rheostat, which can be removed for remote control, gives continuous control by adjusting the direct current through the control coils. These controls yield a wide welding current range of 35 to 425 amp for use with a variety of electrode sizes for repair, maintenance and production welding.

A welding core of electrical steel and the absence of moving iron core or adjustable air gaps, assure quiet operation For easy handling by crane or hoist, a lifting eye is provided. The unit can also be supplied with portable mounting. *Hobart Brothers Company, Hobart Square, Troy, Ohio.*



Industrial Radiography

The Iridium Isotron allows sources of up to 75 curies to be exposed at distances of up to 50 ft from the operator, who can expose the source while remaining behind a concrete wall or personnel shield. It was specifically designed for the remote handling of Iridium 192 in industrial radiography.

The device can be utilized for the kind of shots that cannot be handled conveniently with X-ray equipment. For example, panoramic exposures where several specimens are arranged around the source and shot simultaneously, and internal exposures where the source is exposed within a cavity in the specimen and the film is wrapped around the outside.

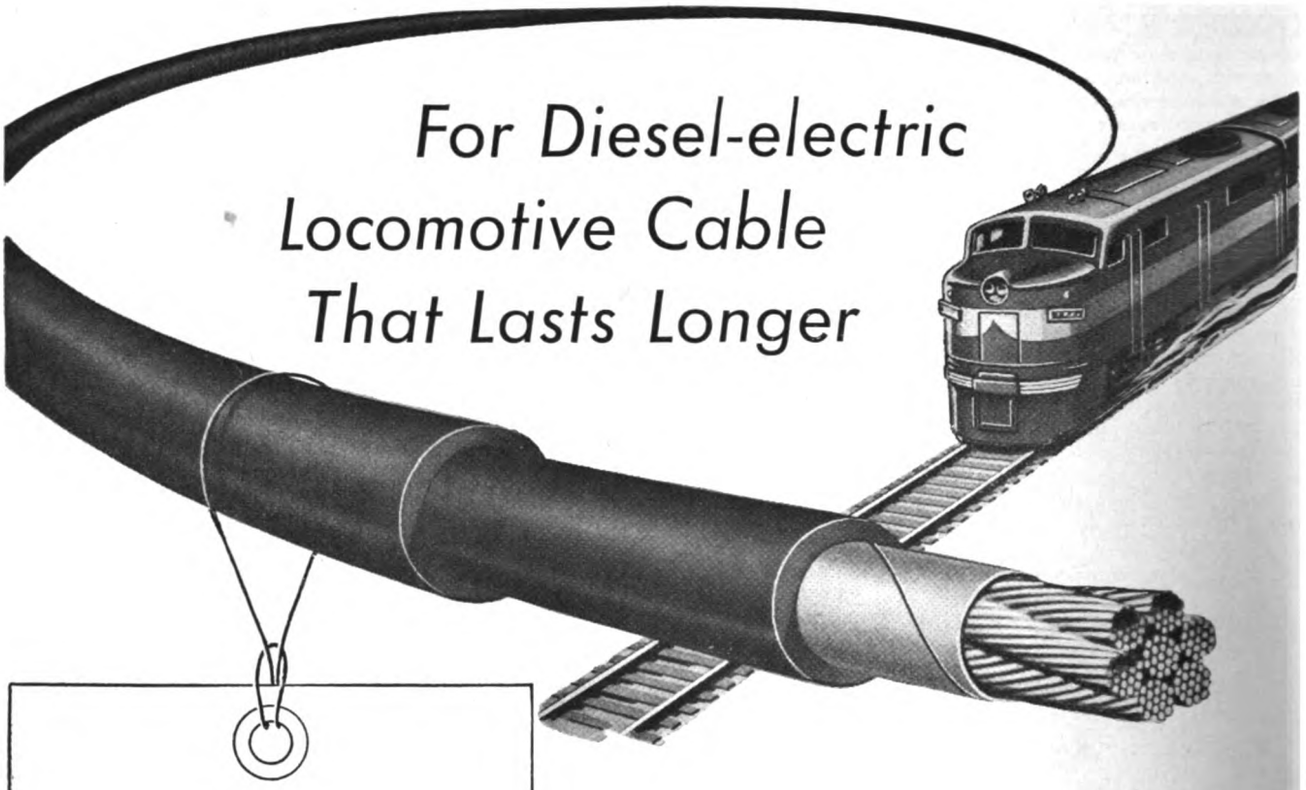
The Isotron is completely portable, requires no power and weighs only 125 lb. Exposure times comparable with those for X-ray equipment are obtainable. It has greater sensitivity, and still retains nearly the range and latitude of Cobalt 60. *Gamma Corporation, Mansfield, Mass.*

Optical Straightedge

A beam of light, interrupted by the inscribed reticle of a precision feeler microscope, measures deviations as small as 0.000025 in. on flat surfaces up to 20 in.

(Continued on page 26)

For Diesel-electric Locomotive Cable That Lasts Longer



G-E VERSATOL GEOPRENE resists—

- FLYING GRIT AND SAND
- OIL
- WATER
- CLEANING COMPOUNDS
- LIVE STEAM
- ICE DAMAGE

G-E Versatol* Geoprene* cable has a neoprene-base jacket that resists flying dust, grit, and sand. It withstands oil, water, cleaning compounds, live steam, and ice. The extra-flexible rope stranding is designed to stand up under continuous flexing.

Fine stranding makes this cable extremely easy to handle and to pull through conduit. Insulation strips cleanly. The carefully controlled diameter and concentricity of the cable provide a proper fit at all bushings and terminals.

G-E Versatol Geoprene cable is immediately available from stock in sizes No. 14 Awg and larger for power circuits (1000-volt rating); in sizes No. 16 and 14 Awg for control circuits (300-volt rating); and for general-purpose wiring. Control cable has rating printed on the surface for easy identification.

*Registered Trade-mark General Electric Company

Technical Information available

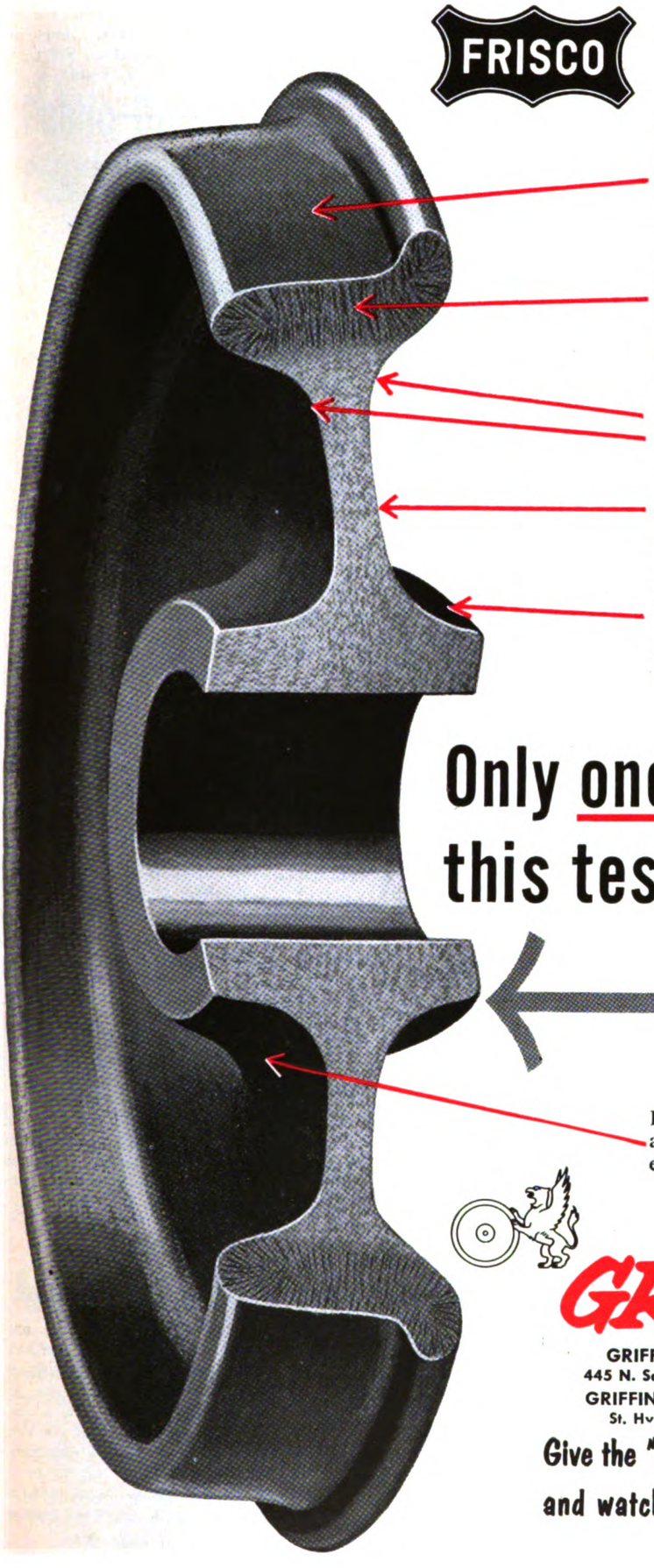
Special high-temperature G-E cables are available for use in high-heat areas. For complete information, general purpose or special application, write for specification booklet "G-E Diesel-electric Locomotive Cables." Section W159-547, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

FRISCO

The Frisco is one of the progressive railroads now testing the Griffin EQS.



Roundness of EQS wheel is practically perfect—as-cast. No machining necessary . . . the toughest and longest-wearing metal is *on the tread, NOT in the scrap bin.*

Pressure pouring in graphite molds results in superior flange and tread wear. Note the directional solidification in flange and tread, shown before heat treatment: *the grain of the metal in EQS wheels is at right angles to the point of wear.*

Long sweeping fillets under flange and rim of EQS wheels insure greatest possible strength.

The Griffin EQS plate is of *uniform thickness*, dimensionally accurate in any section.

Now made of .75 carbon steel. Exclusive casting process used in producing EQS wheels permits use of recognized steel analysis that will best meet your requirements.

Only one wheel can pass this test with a score of 100

Location of hub and plate is identical in all EQS wheels; dissipation of heat is even, without developing internal stress.

GRIFFIN EQS
ELECTRIC QUALITY STEEL

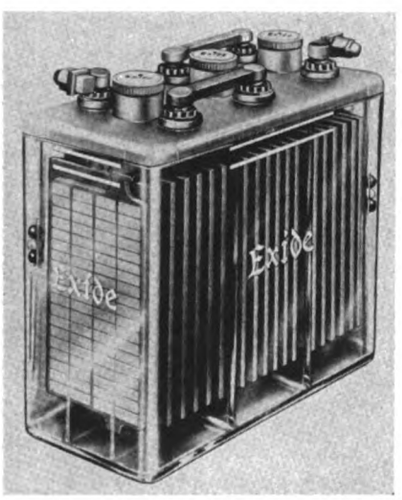
GRIFFIN WHEEL COMPANY
445 N. Sacramento Blvd., Chicago 12
GRIFFIN STEEL FOUNDRIES LTD.
St. Hyacinthe, Quebec, Canada

Give the "green" to GRIFFIN... and watch your costs go down!

long. According to the manufacturer, it provides accuracy of measurement to smaller-scale machining or polishing operations.

A prism-and-lens housing, resting on two metal blocks over the work, permits the feeler microscope with its built-in illumination to ride along the surface under examination. Deviations observed through the microscope are indicated by the relative position of two indices and are converted into linear measurement by reference to a micrometer thimble.

This optical straightedge can be used in checking surface deviations in machine tool tables, surface plates, flat beds, slideways, sylinders, etc. *F. T. Griswold Manufacturing Co., 305 W. Lancaster Avenue, Wayne, Pa.*

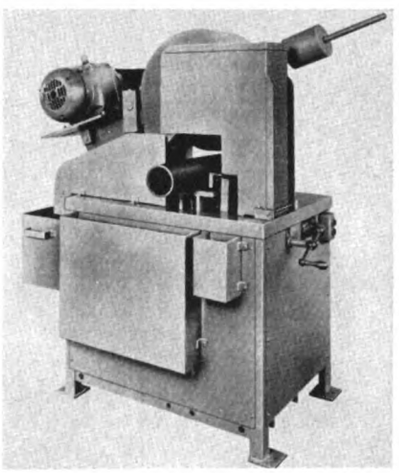


Storage Battery

This plastic-cased battery, the 3-COE-7 Tytex, is for emergency lighting. Eight to twelve years of useful life is anticipated for the unit according to its manufacturer. Pasted type postive plates of ¼ in. thickness and active material of special formulation contribute to this long life. Negative plates of heavy, rugged construction are in balance with the positive plate characteristics.

Short circuits, one cause of failure in control circuit batteries, are prevented by triple insulation with inert plastic and rubber. Polystyrene, a clear, heat-resistant plastic, was selected for the container and cover.

State of charge is indicated by colored pilot balls floating in a vertical channel molded into one corner of the container. The battery requires addition of water only once or twice a year under normal circumstances. The device, available in several capacities and container styles, is supplied filled with electrolyte and charged for immediate service, charged and dry, and uncharged and dry. *Exide Industrial Division, Electric Storage Battery Company, Box 8109, Philadelphia 1.*



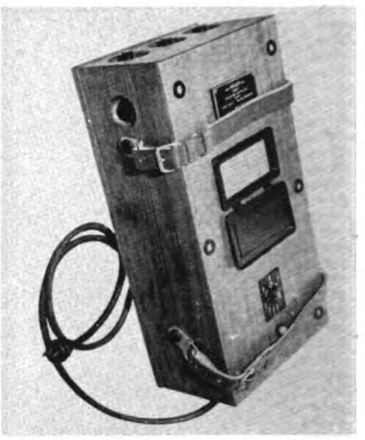
Dry Abrasive Cutting Machine

Available in both stationary and portable types, this dry-abrasive cutting machine is capable of a speed of approximately 3 seconds per sq in. of material being cut.

Known as Model No 28 SeverAll, the unit was designed to handle material up to 4 in. square at 90 degree to axis for solid steel and 8 in. at 90 degree to axis for channels. These specifications are based on using an 18 in. cutting wheel with a 10 hp motor.

Being an oscillating type device, the amount of abrasive wheel contact is reduced and cutting is performed with a minimum of pressure on the abrasive wheel. A double-acting work holder automatically positions the material in line with the center of the wheel. The material is then clamped at both sides of the cutting wheel by a hand-operated crank handle.

The device stands 62 in. high, is 32 in. wide and 56 in. deep. It weighs 750 lb stripped and 950 lb with its electrical equipment. The portable model can be moved through the use of four wheels. *Campbell Machine Division, American Chain & Cable Company, Inc., 929 Connecticut Ave., Bridgeport 2, Conn.*



Insulation Resistance Tester

This tester can be useful in several kinds of preventive maintenance tests, particularly in testing circuit breaker bushings, and in making time-resistance or dielectric-absorption checks on apparatus which has relatively high 10 minute insulation resistance values.

The device, a rectifier-operated Megger, can be used where a number of tests are to be made in one location, as in testing separate conductors or cables, where high resistance values are indicated continuously and as a convenient source of direct current at a relatively high voltage.

There are two models available, one having a range up to 100,000 megohms at 5,000 volts with 1,000 and 2,500 volt intermediate ranges, and the other having a range up to 200,000 megohms at 10,000 volts with no intermediate voltage ranges.

The d-c power supplies for both units include conservatively rated selenium rectifiers and constant voltage transformers. Moving systems of the units are equipped with vibrators to reduce pivot to jewel friction so that high sensitivity can be achieved. *James G. Biddle Company, 1316 Arch Street, Philadelphia 7, Pa.*

Low Hydrogen Electrode

This new electrode, Strikeasy LH-1, provides faster and easier operation than conventional low-hydrogen electrodes, with excellent x-ray properties of weldments, according to the manufacturer. In a controlled test, a deposition rate of 61 per cent faster than conventional E-6016 electrodes was realized.

Powdered metal which has been added to the coating contributes to the weld making

(Continued on page 86)

EDITORIALS

Public Opinion Can Be Important

Riding on trains one will see from time to time a group of passenger cars marked "Condemned." Sometimes these cars remain in view of the railroad passengers for a few days. Sometimes this stretches into weeks.

At first thought it might seem a rather trivial matter as to where a railroad keeps cars that it is about to scrap. But a little more reflection on the subject may show that it is not completely lacking in importance.

The effect on public opinion is bound to be unfavorable. Of those who see it, there will be some at least who will think that the disposition was something forced upon the railroad. The term itself could easily convey this impression. There will also be some who will find no difference between the cars to be scrapped and those in which they are riding.

To the railroad mechanical man, such a conclusion may seem rather ridiculous. To his *trained* eye the difference between series of cars may be obvious a block away. But to the *untrained* eye of the traveler, there is no discernible difference. He therefore reaches the conclusion you would expect, and it does not enhance his opinion of how up-to-date the equipment on the railroad is.

If it is impractical to keep such cars hidden from general view, perhaps a different term or method of marking could be used.

More important than the case itself is the example that the railroad mechanical man is frequently completely oblivious the effect some of his actions have on public opinion. This is important for any industry. It is particularly important for the railroads because of the multitude of regulations which they must live with, and which are determined in the long run by the general public. The elected representative of the public, and the regulatory commissions responsible to this same public. will treat the railroads in some proportion to the interest and sympathy shown to their problems by the people generally. Is not their interest and opinion therefore worth cultivating at every opportunity?

Are We Kidding Ourselves?

Records of steam locomotive maintenance costs accumulated over a period of many years showed that they increased from year to year at about a uniform rate. Diesel locomotives are still so new that the maintenance cost figures are a little confusing, but it is becoming increasingly evident that as compared with first costs they are subject to the same basic law. They rise at about a uniform, but at a considerably higher rate than those for steam locomotives. This is no reflection on diesel locomotives, since they have been a boon to the railroads and have helped them over trying times.

It is possible, at a price, to maintain any locomotive—steam, diesel or electric—at almost any percentage of its original condition that a user may wish. But eventually, maintenance costs rise to a point at which it is no longer practicable to maintain the old unit. Obsolescence—the introduction of new and better units of course add to the desirability of replacement.

It is the practice on most roads to record cumulative maintenance costs. These average in the costs in early years of locomotive life with current costs, and they actually show only 50 per cent of the real rise above the figure for the first year. If an economic life for a diesel locomotive is established, it would appear that it should be based on current, and not cumulative, costs. The latter look nice on paper, but it would appear that we are kidding ourselves if we use them for establishing locomotive life.

NEW BOOKS

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING —1954. This volume, containing the proceedings of the Plant Maintenance and Engineering Conference which are regarded in engineering circles as the most important statement of current factory maintenance problems, is the most extensive ever published in the series. It contains texts of papers read by 24 authors, and direct answers to more than 1,300 questions. An outstanding feature this year is the summary of 20 roundtable discussions. Separate roundtables were devoted to maintenance problems in many industries. The conference last January was attended by 2,400 engineers from many foreign countries. The two principal sessions this year were devoted to "Planning and Scheduling Maintenance Work" and "Maintenance Cost Control and Budgeting." Other sessions covered preventive maintenance; training people for maintenance work; organization, policies and procedures for effective maintenance; sanitation; work measurement, standard and incentives; getting management approval for maintenance programs; handling maintenance labor; corrosion; hospitals, medical department and first aid rooms, and waste disposal. Roundtables, other than those devoted to specific industries, covered maintenance of plant buildings; electrical distribution systems; electronic controls; use of handling equipment in maintenance work; maintenance of materials handling equipment; lighting equipment; lubrication; plants having less than 25 maintenance employees; maintenance storekeeping; mechanical service equipment; power plants, and janitor work.

Clapp & Poliak, Inc., 341 Madison avenue, New York 17.

Solid bearing cars earn equivalent of

$250,000 EXTRA REVENUE PER YEAR

on each 1000 car investment

You get more cars for your money when they're solid-bearing-equipped — and a bigger return per dollar of car investment regardless of traffic conditions.

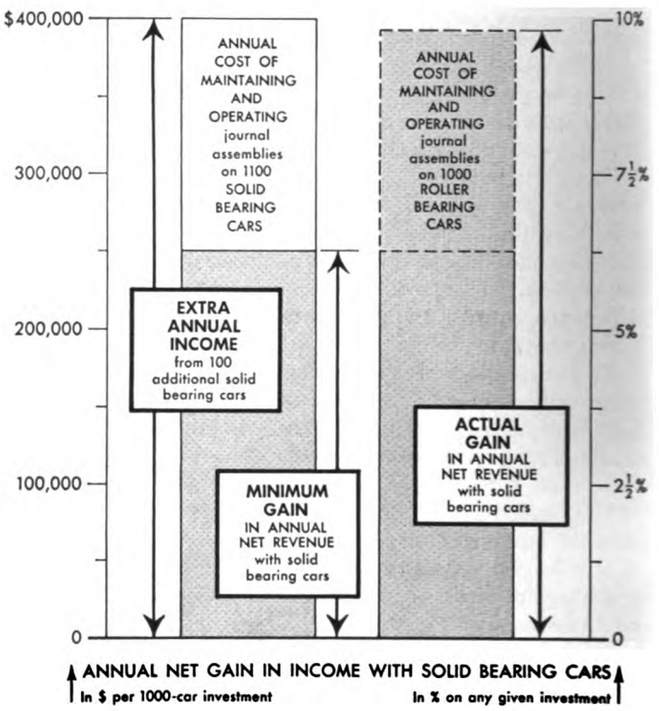
For the same amount of money needed to buy 1000 average roller bearing freight cars, you can buy 1100 or more solid bearing freight cars. And if you want to know what the *loss* on the roller bearing investment would be, here's a rule-of-thumb to figure it.

First, assuming the extra cars are needed, you estimate their average earnings. Then, from this sum, about $400,000.00, you subtract the difference, if any, in maintaining and operating journal bearing assemblies on 1100 solid bearing cars as opposed to 1000 roller bearing cars.

Conservatively, you'll find your minimum annual gain with solid bearings to be about $250,000.00, and it may be as much as $400,000.00.

By the same token, suppose you only need 1000 cars to meet your traffic requirements. With solid bearings, you reduce your initial costs by at least $600,000.00 and you get the same proportionate increase in return per dollar of car investment represented by the $250,000.00 to $400,000.00 above. And since both freight revenues and bearing operating costs are proportionate to car use, this comparative increase in return with solid bearings holds true regardless of traffic conditions.

Write us for a detailed analysis of the economic advantages of solid-type bearings for freight cars. We will also be glad to give you information about ways to improve journal bearing performance. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

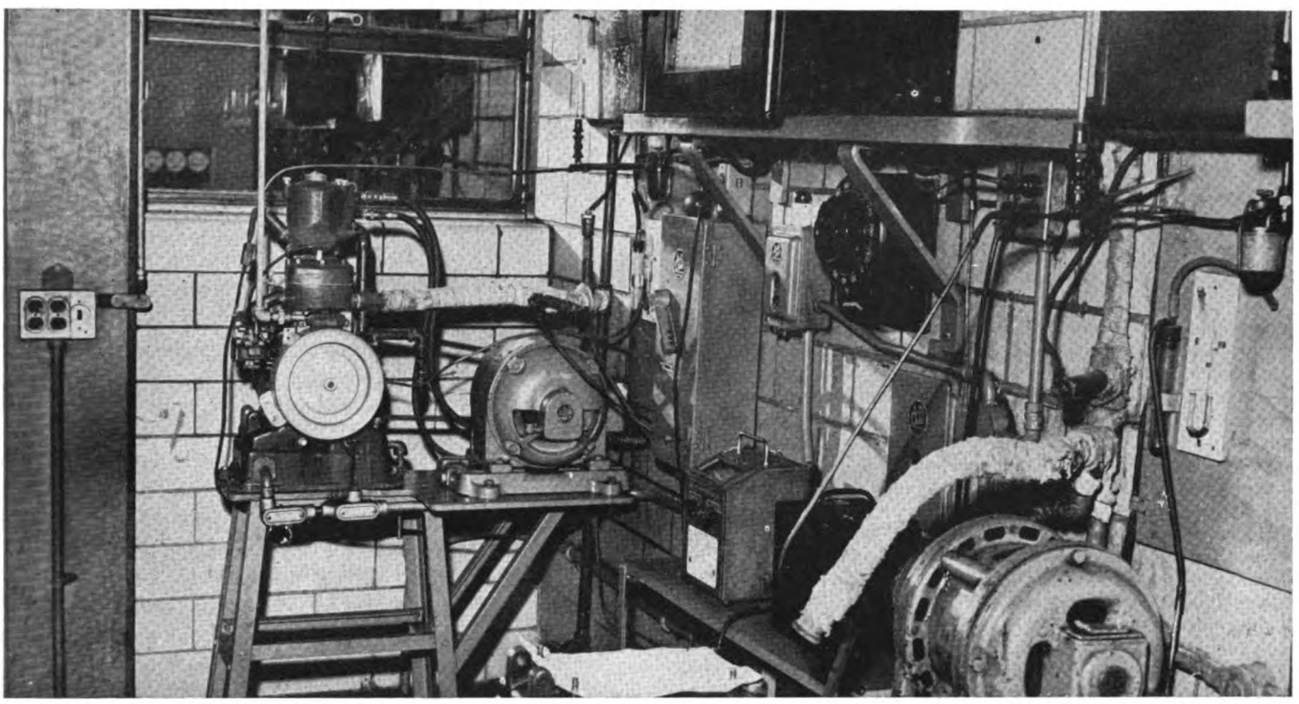


The left hand column indicates the average extra annual revenue that can be earned by buying 1100 solid bearing cars instead of 1000 roller bearing cars, and the center box indicates the minimum revenue gain that would result if the roller bearings could eliminate all maintenance and operating expense. The actual annual net gain, of course, would be this minimum gain plus roller bearing maintenance and operating costs as indicated in the right hand column.

MAGNUS

Solid Bearings

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**



Single-cylinder engines and controls which tell how a given lube oil will affect pistons and rings.

How Rock Island Test Lab Helps Get The Most Out of Diesels

It aids shop forces in many ways from devising a safe way to mix lube oils to establishing standards

The role of a test department in diesel operation and maintenance has come a long way from the early days of the diesel when the principal function was little more than finding out if the lube oil was too thick or too thin. On the Rock Island this progress has taken the form of contributing to better diesel operation at lower cost by making it a simple matter to:

1—Pick out from a group of engines coming due for scheduled repairs the ones that, even though they may have lesser mileages, should be shopped first.

2—Similarly, to keep in service beyond the scheduled mileage for repairs those engines that are in good shape.

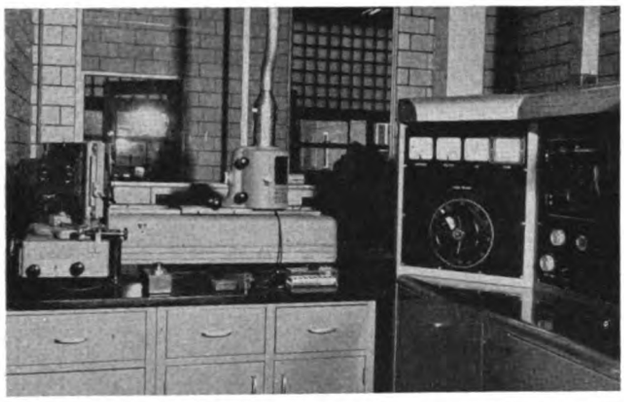
3—To establish lube oil standards to assure adequate lubrication and cooling of the engine yet have the oil "weaker" than the engine so that defects will show up and be detectable in the oil before serious damage to the engine occurs.

4—To determine by accelerated test and with no damage to the diesel engine parts the effect that any oil will have on bearings, pistons, liners, etc.

5—To correlate with practical experience some of the highly technical lab tests to make the results meaningful in terms of what the shop must do and when.

Just how much the Rock Island test department contributes toward stretching mileage between repairs on diesels in spite of heavy loading can be seen by examining the operating practices and general maintenance philosophy of the line and how both compare with other railroads.

There are two schools of thought on the relationship of maintenance requirements to load conditions and how this relationship affects overall diesel operating cost. One school sets the controls to reduce the horsepower output of the engine about 10 per cent on the theory that the maintenance savings will offset any additional operating



THE ROCK ISLAND'S NEW $25,000 SPECTROGRAPH has speeded up lube oil testing to where a complete analysis of 10 elements in the oil can be met in less than in half a man-hour. This relatively fast handling makes it feasible to check road units weekly and switchers monthly whereas prior to the installation of the new machine oil tests could be made on only a few engines suspected of being in distress —an unsatisfactory procedure for controlling maintenance because of number of examinations even on an engine tested was often insufficient to diagnose its true condition.

Generally speaking, there are two basic types of spectrographs being installed by railroads today. One is designed solely and specifically for lube oil testing. The second type handles a wider variety of work. It is this second general type that the Rock Island bought. While this type may not handle lube oil testing quite as fast as the first category, the Rock Island feels that the slight additional time required is more than compensated for by the added versatility of the instrument, which in addition to its main job of keeping tab on diesel engine condition can also be used for such other lab work as checking the composition of such diverse materials as cement, ballast, steels (especially expensive alloy steels) brass, paint pigments and finding foreign materials in a car of cement.

costs from having to run more units on some trains to get the required horsepower. The other school believes that it is cheaper in the long run to load diesels to capacity, especially during business peaks when two units may be loaded to the extent that three ordinarily might be.

The Rock Island follows the second practice, believing that (1) the use of detergent oils permits diesel engines to be operated at heavy load factor without increasing repair costs to the point where such increase would cancel out the operating savings; and (2) better use can be made of available capital if only the minimum number of units required to handle the tonnage were purchased.

The operating result of this policy is that the Rock Island's average trailing tons per unit is about 25 per cent above the national average and about a third greater than some neighboring roads that reduce horsepower and use straight mineral oil. Despite the heavy loading, there are engines in freight service that have gone over a million miles without removal from the locomotive, and a number with from 600,000 to 800,000 miles. On all these units, piece meal repairs only have been made to the engines and main generators.

Where engines on the Rock Island were formerly removed and given a general overhaul at 550,000-600,000 miles, they are now usually removed only for low oil pressure. If both the engine and the bearings have high mileage, the first thing done is to renew the bearings. If the engine still shows low lube oil pressure, it is removed. A high-mileage engine is also normally removed for low oil pressure if the bearings have been recently renewed.

The Rock Island feels that two practices permit the extended mileage between repairs despite the heavy load under which the engines operate—the use of detergent oils and an extensive policy of checking its lube oil with emphasis on the interpretation of the results, by means of which any difficulty arising in any part of the engine can invariably be detected at an early stage before it causes serious damage.

Where The Program Begins—And Why

The lubrication program starts with tests on new oils themselves. After checking physical and chemical characteristics known to be essential for a crankcase oil by conventional laboratory methods, other characteristics found to be needed from operating experience are checked by accelerated tests assimilating service conditions.

The test under simulated operating conditions reveals directly the practical results that can be expected with an oil in the form of dirt accumulated, deposits on the different engine parts and the wear. The test is made on a one-cylinder gasoline engine that is operated under closely controlled conditions such as horsepower developed, rpm, air-fuel ratio, quantity of fuel used per minute, temperature of crankcase oil and coolant, and air pressure in the crankcase.

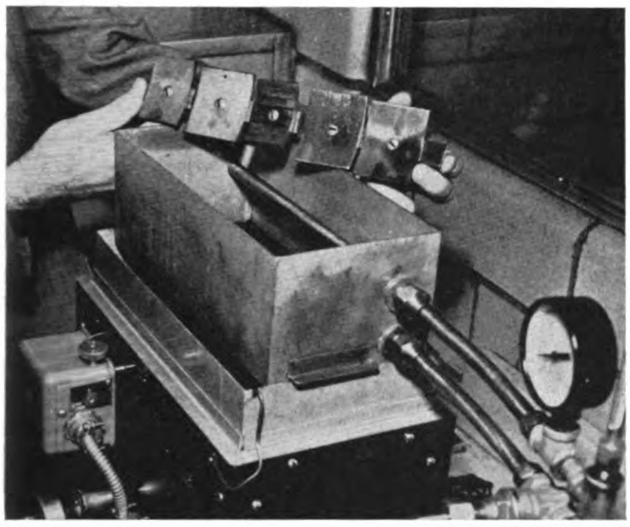
The parts are accurately measured and weighed before and after each test. The quantity of lube oil used and the analysis of the oil before and after the test is recorded. The dirt accumulated on the engine parts is weighed. Appearance of the piston skirt as to discoloration and gum and lacquer formation is made and evaluated. The condition of the rings, ring grooves, ring lands, and fit of rings in the grooves, whether free or sluggish is noted.

In order to make this a quick accelerated test that can be used not only for approval of new oils and additives but also for checking individual shipments of approved oils, the temperature of the coolant is raised to 375 deg. and that of the crankcase oil to 300 deg., or approximately 126 deg. higher than in an average normal operating railroad diesel engine. As every 18-deg. rise in temperature doubles the oxidation rate, a 30-hour run in the test engine is equivalent in oxidation to 3,840 hours in a locomotive diesel.

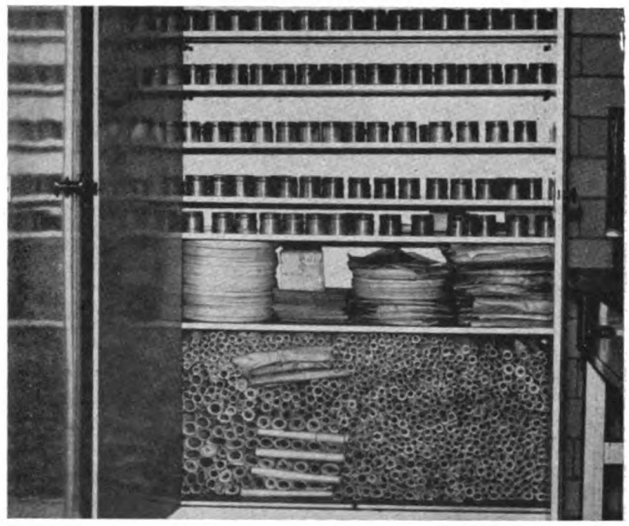
In granting approval to a new oil, two 30-hour tests are run with the engine torn down and examined in between. For routine checking of individual shipments of an already approved type of oil, one 30-hour period is considered sufficient (the 3,840 hours would be equivalent to about 200,000 miles on a passenger engine).

The reasoning behind the 30-hour accelerated test is as follows: It is assumed that an "oil change" due to consumption takes place every 20,000 miles of operation. Therefore, when an oil stands 30 hours in the test engine, the 200,000 miles of service that the 30-hour test is equivalent to is ten times as long as the oil would ordinarily have to stand up in the engine without extensive or harmful lacquering of parts or sticking of rings.

Future reference to any particular test is easy. The piston used is marked with the number of the test and stored in a metal cabinet with the paper records of the



Hot oil spray gives the effect either of a new oil on approved bearings or approved oil on new bearing materials



Numbered pistons serve as own record of deposits, stuck rings, etc. from a test oil. Bottom shelves contain paper data

test (e.g. time, water and oil temperature graphs, etc.) are stored below. Thus, to see what the oil in test No. 483 did to the piston, it is only necessary to find the piston numbered 483. This will show how much gum, lacquer and other deposits formed on the piston, whether the rings were stuck or free, condition of the lands, etc. At the same time the paper records in the lower part of the cabinet will give remaining pertinent data desired.

Oxidation and stability of the oil, and its effect on bearings, is tested by spraying hot oil at 300 deg. F. on pieces of bearing metal and on pieces of pure lead and copper. In this test a pump takes heated oil from a tank and forces it through nozzles on to the bearings in an enclosed space. The test pieces are cleaned and weighed before the start of the test, and weighed again after each of three 5-hour periods. The oil is analyzed before the test and after each 5-hour period. This test serves as a good comparative evaluation of oils for approval and as a means of checking shipments of oil for quality control. This test can also be used to test new bearing materials by spraying them with an approved oil.

The Rock Island feels that resistance to oxidation when heated is a desirable quality in a crankcase lubricant because 85% of the function of the oil is to cool the engine, and only 15% is for actual lubrication of friction surfaces. Also severe local heating requires that the oil must be able to stand extremely high temperatures of short duration.

Why Oil Should Not Be Too Stable

Resistance to oxidation might at first seam to be a case of the more the better. Actually, the resistance can be carried too far. If oil were to be made absolutely stable to temperature, an abnormal operating engine could not be detected by testing the oil. Making the oil tougher than the engine would remove the best present means of finding heat distress from clogged and inoperative oil coolers and radiators, shutters, clogged oil lines, or many other things that would lead to an overheated engine with resultant destruction of parts. Actually there is no oil available that is this stable to temperature, but if it were possible to make such an oil the engine might become badly damaged with no warning showing up in the oil because it would still be in good condition after the engine became inoperative.

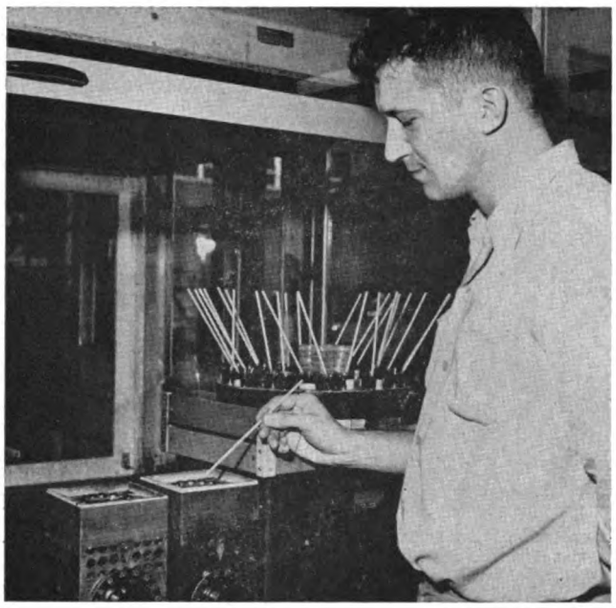
When diesels were first put into operation, the gumming and lacquering of pistons caused the Rock Island to feel that straight mineral oils were not satisfactory. The road still follows a policy of using heavy duty or detergent oil, and two years ago added a unique feature to the program.

In October 1952 the Rock Island began buying a number of different base stocks to a specification and mixing these with one additive at a definite percentage. The work is done at Silvis, mixing the additive with a tank car lot at a time of the specification oil from one of the supplying oil companies. This oil can then be used in any engine on the road as all oils, regardless of the supplier, have the same additive. Except for mixing only one base stock at a time with the universal additive, no attempt is made the keep different brands separated or distinguished either in storage or in an engine.

Drainage from all engines using the same SAE grade is reclaimed by heating and steam stripping off the volatile contaminants, then removing the remaining contaminants by clay contact and filtering. At first this oil was used only in switchers without refortification with additives. The next step was to re-fortify but still restrict its use to switch engines. Today by pre-treating with acid in addition to the regular process, the drainage is brought to the same specification as new base oil. It meets the same tests and requirements, and is universally used in all types of power, the same as new oil.

Oil Tests Control Maintenance

Two general types of tests are made on lube oil to determine the need for many types of repairs. The first type comprises the typical checks of physical characteristics (flash, viscosity, water, etc.) made by most roads, plus blotter spot tests. Oil samples for these tests are taken weekly on switchers and sent to the laboratory of the terminal for the area where the switcher operates. Samples on road units are taken each time a unit arrives at one of the four terminals on the system. If the unit



Oil for spectro analysis is sent in disposable plastic vials and the sample removed by a soda straw

is to spend over an hour in the terminal, the tests are completed, and the results are used for recommending any work needed, such as oil or filter change.

While the spot tests are used primarily to indicate when to change lube oil filters, careful observation and interpretation of a series of spot tests under ultra-violet light has been found to tell a great deal about the condition of the lube oil as to oxidation, detergency, presence of fuel dilution and water.

A daily report of results is submitted to the Chicago Laboratory from each of the control laboratories, and these results are recorded on a card which is kept for each engine, and from which card a tabulation is made at the end of each month of the number of tests made, number of engines, per cent showing light, medium or heavy dilution, water present, drainages recommended due to oil conditions, etc. These tabulations are compared with the previous month, and with the same month of the previous year.

The spectrographic analysis is the most meaningful of the tests made on the lube oil in terms of what it can tell about the condition of the different engine parts. The procedure for handling the spectro tests is of necessity more comprehensive because the samples must be shipped to the central headquarters and the results analyzed in a short period before any defect brought out by the test has done damage to the engine. The Rock Island procedure for spectro testing and recording is as follows:

The oil samples are taken by the laboratory at whatever one of the four terminals to which the unit is assigned. This is done weekly on a road unit when it goes through its maintenance terminal for inspection, and the sample is subsequently sent into the Chicago Spectrographic laboratory.

A minimum of 50 and an average of 60 samples a day are analyzed and the results recorded. With three men (24 man-hours) this averages 0.4 man-hours per sample, which is expected to be reduced as experience is gained in the technique and operation of new spectrograph equipment. This 0.4 man-hour spent making the spectrograph analysis pinpoints the repair needs of the locomotive as to bearings, rings, pistons and liners, water leaks, oil filter changes, air filter maintenance and lube oil quality.

Experience and judgment play important roles in interpreting the results of the spectrograph tests as to trends. For example, a high silicon can indicate road dirt and would be expected to lead to a high wear rate and consequently a rise in bearing metals (lead, copper, silver) and in iron from the rings and cylinder walls. In most instances these concentrations would be reduced by changing oil filters. Where this does not reduce the concentration, faulty bearings, rings, liners, or oil coolers would be the next logical possibilities to suspect. Reference to regular lube oil control data, and viscosity, flash and spot tests may also give added clues in tracing down the specific cause of wear. Other examples of what the spectro analysis can show and predict are:

Where water leaks are indicated by the presence of chromium or boron in the oil, high readings of bearing metal would be expected to follow because each slug of water in the oil would cause a thin layer of bearing metal to be wiped as it passed through the bearing.

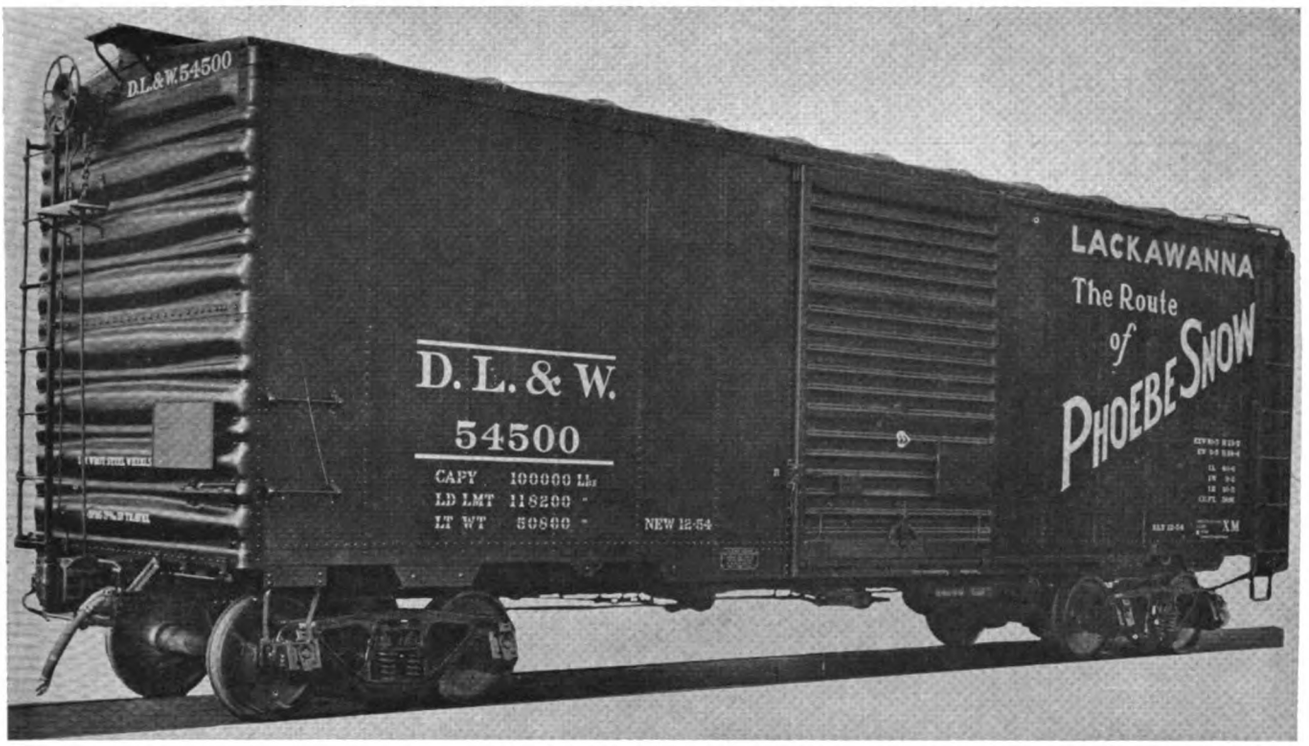
In some engines with aluminum pistons and chrome plated liners, the presence of aluminum along with chrome, even with low silicon, would be strong evidence of piston seizure and would usually be followed by a rise in lead or copper.

Low silicon, with lube oil control tests normal, and a small increase in lead and copper along with a substantial increase in iron, could mean a bearing worn through to the steel back.

Reports of the spectrograph analysis along with what the lab thinks the shop will find are sent to the local foreman in direct charge of the work, to the master mechanic concerned and to the general superintendent of motive power. For future guidance of the lab in improving the accuracy and scope of predictions on what a given reading combination means in terms of engine maintenance requirements, the shop sends the lab a report on what was found when the engine was inspected. This constantly increasing accuracy of interpretation of oil tests in terms of engine work required has been instrumental in extending inspections and overhaul on those engines where the lube oil record indicates low wear and to concentrate on those engines where higher wear is shown by contaminants in the lube oil.

A good example of the way this procedure works is a unit which has accumulated 750,000 miles since overhaul. This unit had been on "watchful waiting" for some time. The engine was not torn down at 550,000-600,000 miles (which was formerly required procedure) because the spectrograph showed it to be in sound operating condition. Instead, it is carefully watched and kept in service until the lube oil analysis showed that overhaul was necessary.

Currently there are five passenger, five freight and eight switching locomotives that are being operated beyond the mileage at which they would have been torn down if rigid mileages were set for overhaul. No definite figures are as yet available on what percentage of units can have repairs postponed, but the number is expected to increase with the continuing improvement in the technique of interpreting the spectrographic analysis and lead to important savings in maintenance costs.



The first Magor-built car. Placard boards on doors and ends can be reached from ground level.

Lackawanna Box Cars Fitted for Modern Service

Sturdy construction aims at low maintenance costs and long life for 1,000 new cars

PARTIAL LIST OF MATERIALS AND EQUIPMENT ON THE LACKAWANNA BOX CARS

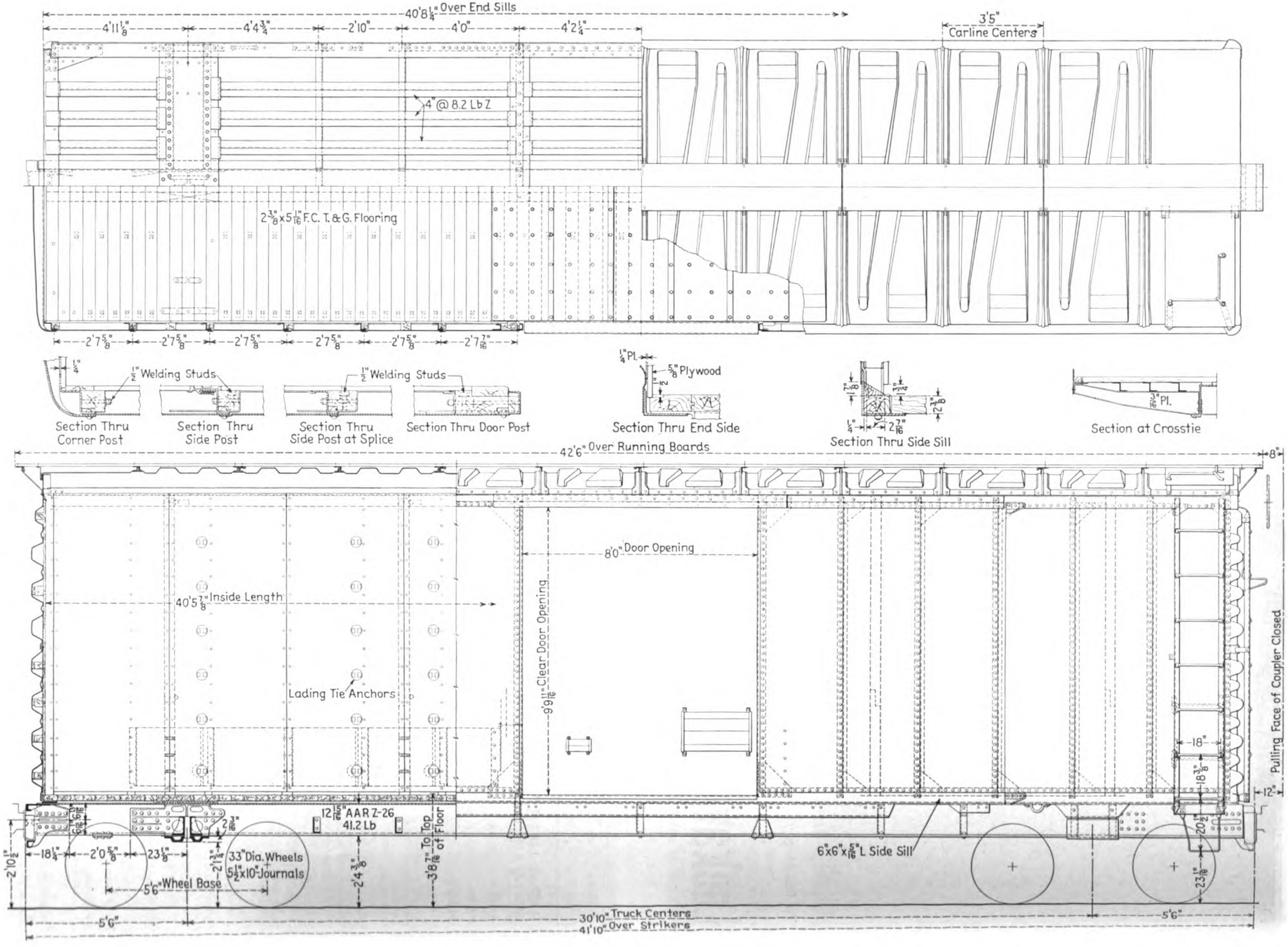
Couplers	National Malleable & Steel Castings Co., Cleveland.
	Symington-Gould Corp., New York.
Yokes	Scullin Steel Co., St. Louis.
	Symington Gould Corp., New York.
Draft gear	Cardwell Westinghouse Co., Chicago.
	W. H. Miner, Inc., Chicago.
	Waugh Equipment Co., New York.
Centering devices	Standard Railway Equipment Mfg. Co., Chicago.
Bolster center filler; striker	Symington-Gould Corp., New York.
Ends; roofs; floor plates	Standard Railway Equipment Mfg. Co., Chicago.
Doors and fixtures	Superior Car Door Co., Chicago.
	Youngstown Steel Door Co., Cleveland.
Running boards and brake steps	Morton Mfg. Co., Chicago.
	United States Gypsum Co., Chicago.
Floor clips	MacLean Fogg Lock Nut Co., Chicago.
Primer and paint	Pittsburgh Plate Glass Co., Pittsburgh.
	Sherwin-Williams Co., Cleveland.
Truck bolsters	Symington-Gould Corp., New York.
Side bearings	A. Stucki Co., Pittsburgh.
	Symington-Gould Corp., New York.
Side frames	American Steel Foundries, Chicago.
	National Malleable & Steel Castings Co., Cleveland.
	Symington-Gould Corp., New York.
Springs	Crucible Steel Co. of America, New York.
Ride Control	American Steel Foundries, Chicago.
Journal bearings	Magnus Metal Corp., New York.
Journal-box lids	American Locomotive Co., New York.
	(Motor Wheel) T-Z Railway Equipment Co., Chicago.
Wheels	Armco Steel Corp., Middletown, Ohio.
	Bethlehem Steel Co., Bethlehem, Pa.
	Edgewater Steel Co., Pittsburgh.
	United States Steel Corp., Pittsburgh.
Brake beams	Buffalo Brake Beam Co., New York.
	Chicago Railway Equipment Co., Chicago.
Air brakes	Westinghouse Air Brake Co., Wilmerding, Pa.
Hand brakes	Ajax Consolidated Co., Chicago.
	W. H. Miner, Inc., Chicago.
	National Brake Co., New York.
Brake regulators	Royal Railway Improvements Corp., Wilmington, Del.
	Westinghouse Air Brake Co., Wilmerding, Pa.

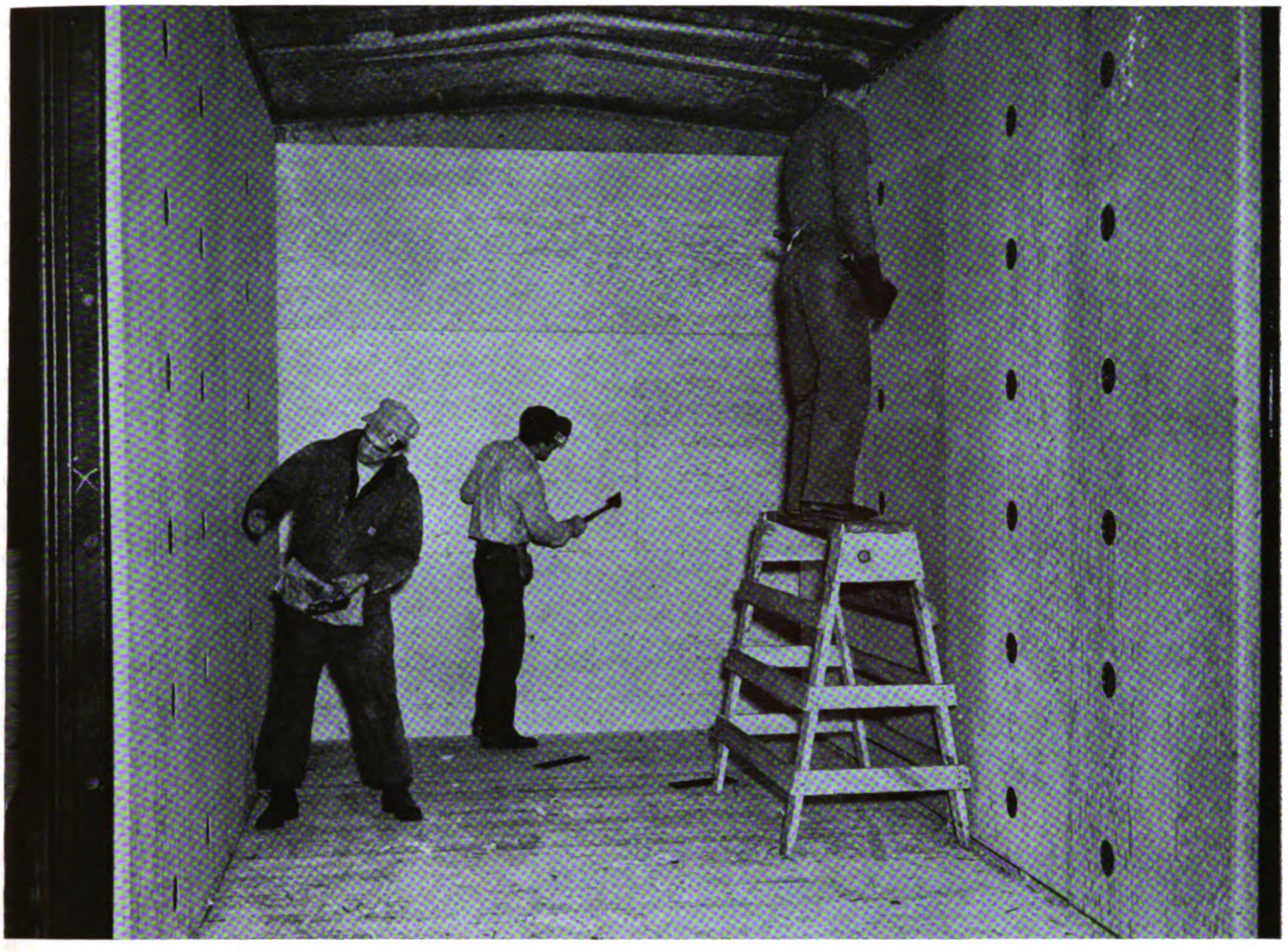
Low maintenance costs, high train speeds and the use of modern materials-handling equipment were important factors in determining the design of 1,000 box cars by the Lackawanna. Orders for these 50-ton cars were placed last August with the Berwick, Pa., plant of ACF Industries, Inc., and with the Magor Car Corporation. Deliveries began in January and were completed during March. Each plant built 500 cars.

The cars are built of copper-bearing steel with a structure heavier than normal for 50-ton cars. Two 41.2-lb. Z-sections comprise the center sill. The side sills are 6 x 6 x 5/16-in. angles. The six floor stringers are 4-in., 8.2-lb. Z-sections. They support a 2⅜-in. wood floor which is reinforced with a 3/16-in. steel protector plate 10-ft wide at the door opening. Each side assembly has two more posts than usual for a car of this type. Gussets are installed at the top and bottom of every post. The sheathing is riveted to the frame. Above the floor level between the side posts and over the ends ¼-in. backing plates are installed. These plates fill the gaps between the frame members and reinforce the bottom of the lining. The lining is ⅝-in. plywood. Seventy-two lading strap anchors are provided on the side walls. The door openings are 8-ft wide.

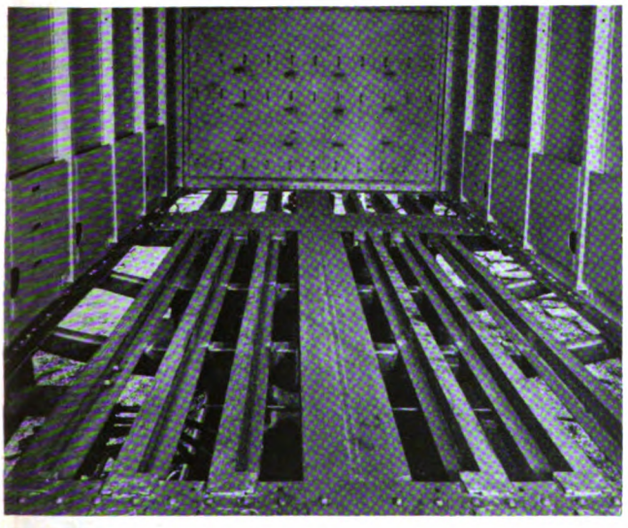
All the cars are equipped with high-speed A-3 Ride Control trucks with 5½-in. x 10-in. journals and one-wear

(*Continued on page 49*)


40'8¼" Over End Sills
4'11⅛"
4'4¾"
2'10"
4'0"
4'2¼"
3'5" Carline Centers
4" @ 8.2 Lb Z
2¾"x5 1/16" F.C. T. & G. Flooring
2'7⅝"
2'7⅝"
2'7⅝"
2'7⅝"
2'7⅝"
2'7 7/16"
¼"
½" Welding Studs
Section Thru Corner Post
½" Welding Studs
Section Thru Side Post
Section Thru Side Post at Splice
Section Thru Door Post
¼" Pl.
⅝" Plywood
½"
Section Thru End Side
1⅞"
1¾"
2⅞"
¼"
2 7/16"
Section Thru Side Sill
16¼" Pl.
Section at Crosstie
42'6" Over Running Boards
8"
8'0" Door Opening
40'5⅞" Inside Length
9'9 11/16" Clear Door Opening
Lading Tie Anchors
18"
18⅜"
12" Pulling Face of Coupler Closed
12 11/16" AAR Z-26
41.2 Lb
To Top of Floor
3'8 7/16"
2'4⅜"
2'10½"
18¼"
2'0 5/8"
23⅛"
2⅛"
2⅛"
33" Dia. Wheels
5½"x10" Journals
5'6" Wheel Base
6"x6"x 5/16" L Side Sill
20½"
23 1/16"
5'6"
30'10" Truck Centers
41'10" Over Strikers
5'6"



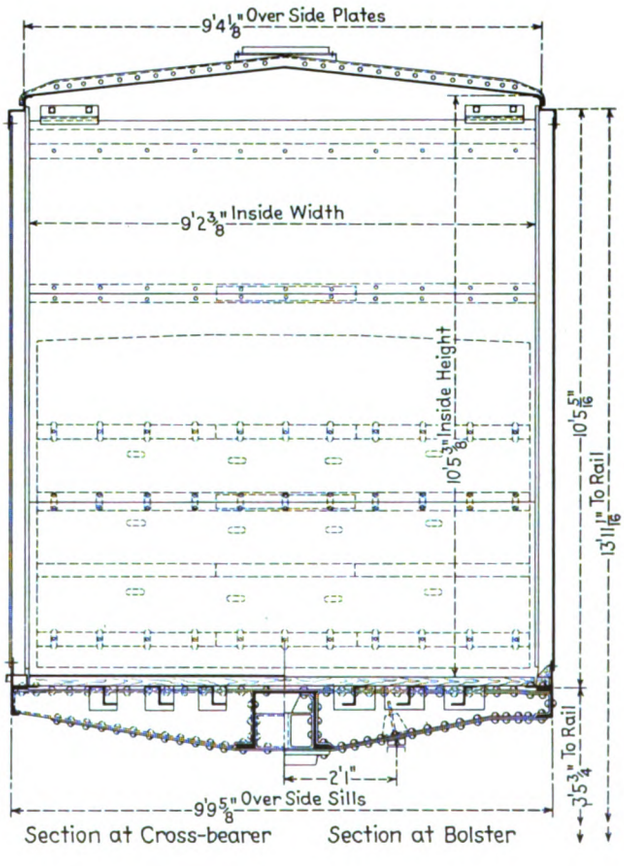
Plywood lining is completed by ACF crew. Already installed are heavy flooring and lading strap anchors



Six floor stringers and backing plates on side and end walls give extra support to floor and lining

wrought-steel wheels. The springs have $3^{11}/_{16}$-in. travel. Unit type brake beams are used. All the draft gears are of the high capacity rubber type. All the axles and some of the truck and air brake material came from the Lackawanna.

The road numbers of the ACF cars are 54000 to 54499, and the cars delivered by Magor are numbered 54500 to 54999. The light weight of the car is 50,800-lb.



GRAVITY CONVEYOR feeds finished wheels from inspection platform to shipping platform.

Here's the AAR, X-2 Wheel

New 1.5 carbon cast-steel wheel has wear resistance of steel wheels plus resistance to brake shoe heating

As far back as 1941 the American Brake Shoe Company assigned priority to a research project to develop a freight car wheel which would better withstand the heavier loads and more severe braking which were becoming commonplace in modern freight operation. The specific objective of this research program was to perfect a wheel combining the physical advantages of steel with economic advantages of modern casting methods.

With that goal in mind, metallurgists at the Brake Shoe Research Laboratories in Mahwah, New Jersey, began a step by step investigation of freight service requirements as a means of determining what the ultimate essentials of wheel design should be. Then began a patient search for the precise metallurgical analysis which would best satisfy these design prerequisites. Six years of experiment and evaluation in the research foundry resulted at last in the development of a unique 1.5 per cent carbon steel which showed outstanding promise for car wheel application. Physical tests were encouraging.

The new steel had thus far proved successful in the laboratory. But how would it perform under actual operating conditions? To answer this question experimental field testing was instituted on the Bangor and Aroostook in July, 1947. Test wheels were placed under a 50-ton rack car where they proceeded to accumulate 5,000 miles per month under constant load of 10-½ tons per wheel—operating over frozen roadbed in the winter and encountering extremes of temperature found in few other parts of the country. Accelerated testing under these severe conditions provided the basis for further design refinements which, in turn, were tested on the same proving ground.

After two years' successful experience on the Bangor and Aroostook, the scope of field testing was expanded through agreements with individual railroads handling special cars over assigned routes. Further extension of field test came in 1951 when the AAR Committee on Wheels granted permission for placement of 1,000 1.5 per cent carbon cast steel wheels in experimental interchange service, designating this type of wheel the AAR-X2. Later, in 1953, anticipating full-scale production of the X-2 wheel, the Committee increased the authorized total to 100,000.

It was Brake Shoe's policy, in pursuing the proof testing of this new wheel, to place in service only a limited number of the originally authorized 1,000 total so that all wheels in service test could be frequently and carefully observed. In this way performance could be measured throughout the service life of each wheel and compared directly to that of standard wrought steel wheels running in each test car truck on a 50-50 basis. Altogether, 202 of the AAR-X2 wheels, made to a standard analysis and metallurgical structure, have been tested throughout the United States under 49 cars.

1 AFTER HEAT TREATING, wheels emerge from furnace in lots of 12. Next step in process will be hub cooling.

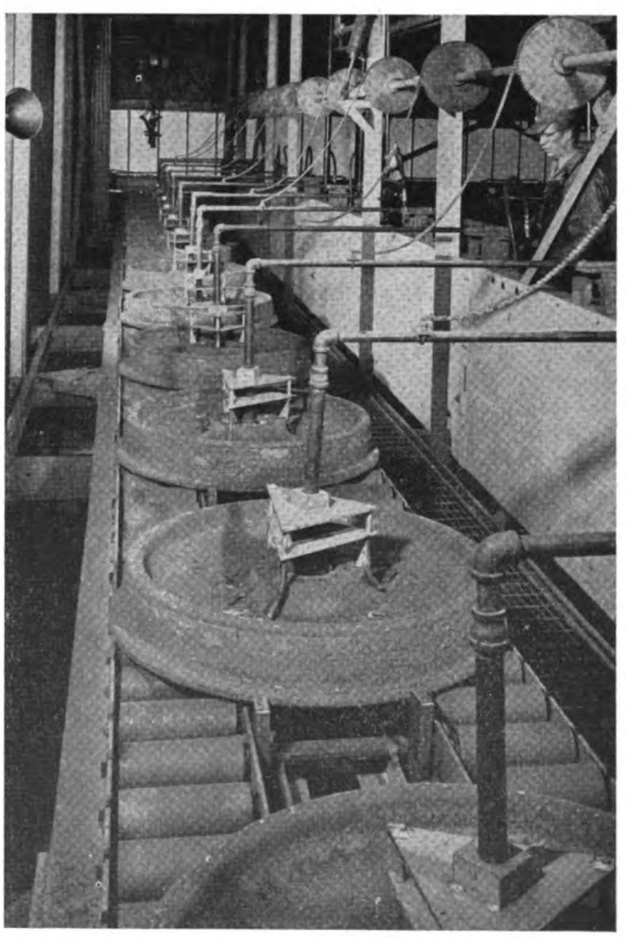
As of April, 1955, after somewhat over 4½ years of actual field testing, all test cars had accumulated a total of 5,200,000 car miles, or an average of 106,000 miles per car. Two test cars have averaged 333,000 miles each on the original AAR-X2 wheels without failure.

The metal for X-2 wheels is melted from cold stock in electric arc melting furnaces. The normal chemical analysis of the metal used in the wheel is:

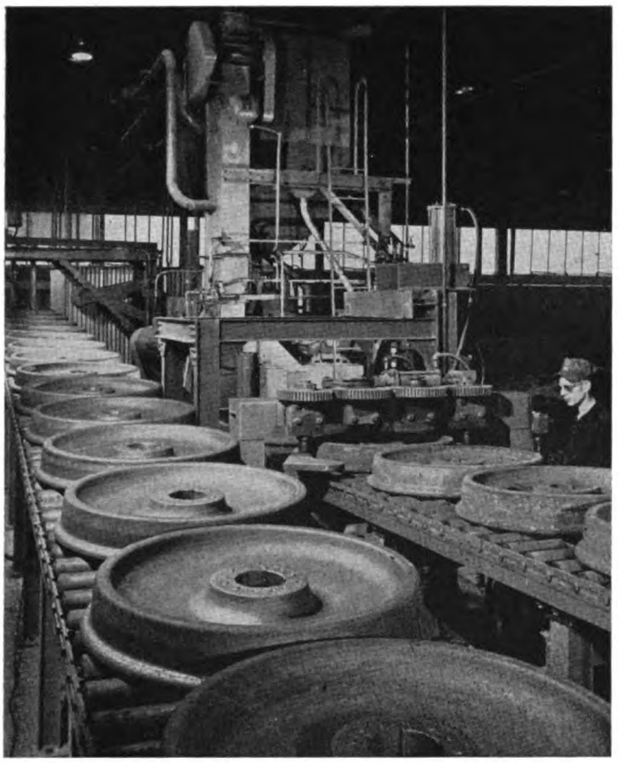
Total Carbon 1.35 to 1.55%
Maganese, not less than 0.05%
Silicon 0.30 to 0.05%
Phosphorus, not over .07%
Sulphur, not over .07%

This metal is similar to common die steels which, like railroad wheels, must withstand a combination of heat, abrasion and impact. Its physical properties include tensile strength ranging between 100,000 and 120,000 psi, elongation from 4 to 6% and yield point of 60,000 to 70,000 psi. The metallurgical structure is uniform from flange to hub and the hardness runs in the neighborhood of 245 to 255 Brinell. Advantages of the 1.5 carbon wheel claimed by Southern are:

- Safety, represented by conservative design, inherent strength, and proved record in road test averaging over 100,000 miles per test car.
- A combination of modern foundry techniques and time-tested casting methods which result in lower costs.
- Automatic machining of all wearing surfaces for precise dimensional control, unsurpassed rotundity, and outstanding dynamic balance.
- Exacting heat treatment for tough, dense, homogeneous steel from flange to hub, exhibiting uniformly superior wearing qualities. No transition areas.
- Conventional steel wheel shop practice for taping,



2 HUB COOLING station where hubs are water cooled to give favorable stress distribution and provide easier bore machining.



3 SHOT BLAST station. Wheels at right are being fed to shot blast; those at left have been processed

4 BORING mill shown here is used for obtaining other than standard bore when requested by customer

boring and mounting. (Three standard tapes).

• Identifying markings cast in bold letters on back plate where they will not be obscured by grease and dirt.

• Wear resistance equal to or greater than that of any steel wheel, plus excellent resistance to brake shoe heating. No indication of thermal checking or cracking in treads on any service test.

By 1953 company officers, having become thoroughly convinced of the capabilities of the new wheel as demonstrated by six years of test, were ready to approve plans for the erection of production facilities. Plant construction began in June of that year.

Built at a cost of $3,500,000 in Calera, Alabama, the plant incorporated the most modern foundry techniques while retaining features of long-proven reliability in cast wheel manufacture. It is located on a 45-acre site 35 miles south of the Birmingham steel center.

The plant is constructed primarily of corrugated asbestos cement sheeting applied to a steel frame, with a floor area of roughly 75,000 square feet. A novel arrangement of vertical louvres forming the outside wall around one end of the building permits opening virtually the entire expanse of wall on three sides for unimpeded ventilation. The administrative office, detached from the plant proper, is air conditioned for summer comfort.

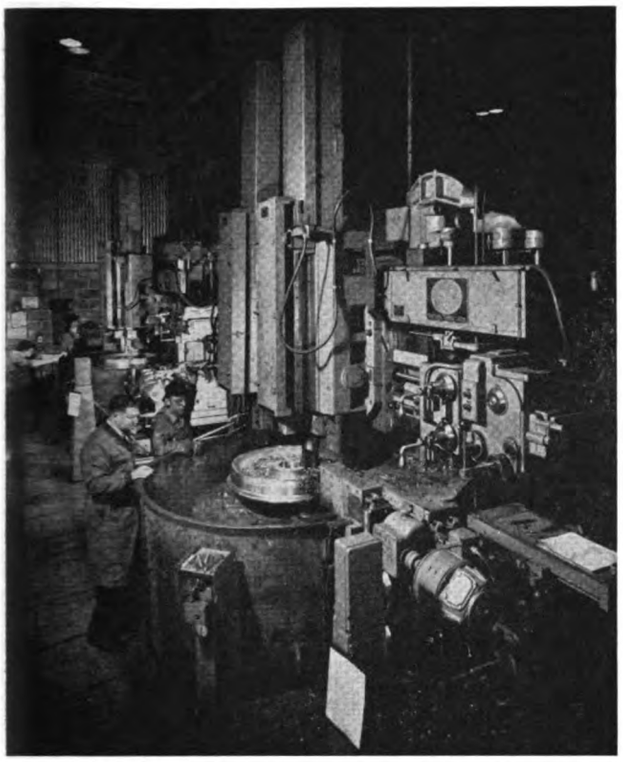
Initial plant operation on a trial scale began in February, 1954. With basic production methods having been largely resolved during earlier pilot work in the Mahwah experimental foundry, rapid progress was made in getting Calera production underway. By April 1, 1955, with installation of some additional equipment still scheduled, output reached approximately 700 wheels per week. At full capacity, the plant will be able to produce close to 400 wheels a day.

Molding—Material storage is concentrated at the east end of the building. Molding and core sands, brought in by rail, are stored in enclosed hopper bins with a present capacity of about 370 tons. At this end of the plant, too, are bins for steel scrap, melting furnace refractories, and various alloy components for the charges.

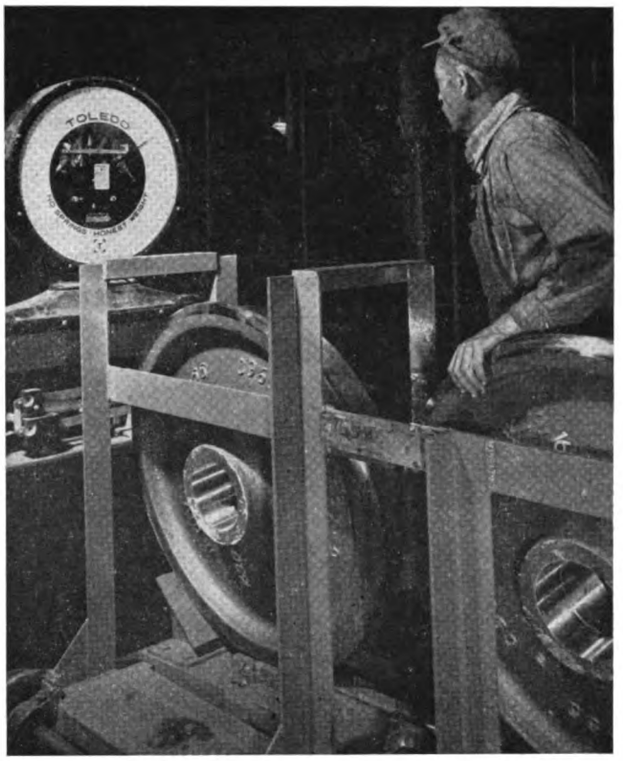
Near the storage area, resin-bonded hub cores are made in aluminum boxes by means of a bench core blower. They are ready for use after only a few minutes baking in a conveyorized, dielectric core oven with capacity of 90 cores per hour. Space and handling are both reduced since there is no need for core storage and consequently no necessity for storage racks.

Two types of sand are used in the wheel molds themselves—facing sand and backing sand. The former is a fine textured new-sand mix which is employed, as the name implies, for the face of the mold next to the pattern. It produces a smooth surface. Backing sand, which comprises the major portion of the mold, is added on top of the facing. Both types, together with their bonding agents, are mixed in an automatic muller which is gravity fed from overhead storage hoppers. An electronic moisture device checks each batch of sand and then adds the proper amount of water. After it is mulled, the sand is dropped into a pressure tank from which it is then blown through a pneumatic pipe system to a storage bin at the molding station. Periodic daily sand tests plus carefully maintained records assure close control of this important production element.

At the molding station an automatic disc-type hydra slinger produces consistently uniform wheel molds at a rate of about 60 an hour. Copes (top halves of molds) and drags (bottom halves) are rammed separately on a rotating turntable beneath the sand-slinger. During this operation, the flask (cope or drag) and pattern rotate while the slinger head travels radially back and



5 MACHINING is done on a bank of Bullard vertical turret lathes with one chucking operation



6 WHEEL INSPECTION—after tape size has been stenciled on wheel plate, weight is recorded and wheels moved to shipping platform

forth. The momentum of the sand entering the flask at high velocity causes it to become tightly packed around the pattern. Mold hardness, an important variable, can be controlled through an adjustable cam which governs slinger head travel and frequent hardness checks are performed on a routine basis. Approximately 800 lb of sand go into each mold.

Flasks of conventional type are used together with tread chillers—a metal ring around the periphery of the mold. The latter produces dense tread metal as well as an accurate contour and promotes directional solidification, in turn, induces soundness.

Melting—Electric furnace melting is used to attain precision in metal analysis. Although provision has been made in plant design for the later installation of cupolas —with a view toward duplexing the metal—current practice has thus far proved eminently successful.

Charges for the electric furnaces are made up adjacent to the scrap bin in bottom-drop charging buckets. Selected charges, usually containing a large percentage of broken-up scrap steel wheels, are loaded into the buckets with an electromagnet, and are weighed as loaded.

The complete battery of four 3,500-4,000 kva, 9-foot, top-charging arc melting furnaces have been installed. Three are currently in operation. These have a nominal capacity of from 6 to 7 tons and require approximately 60 minutes to melt down a cold charge. Actual furnace capacity is determined by the thickness of the refractory insulating walls. Each 12-wheel heat is melted under closely controlled basic oxidizing conditions with careful attention given to temperature and analysis. Alloy additions are made at specified intervals during the heat.

Shortly before a heat is tapped, samples are taken from the furnace to the chemical laboratory, which furnishes at least two preliminary carbon determinations for that heat. The laboratory also performs a comprehensive chemical analysis for each heat poured.

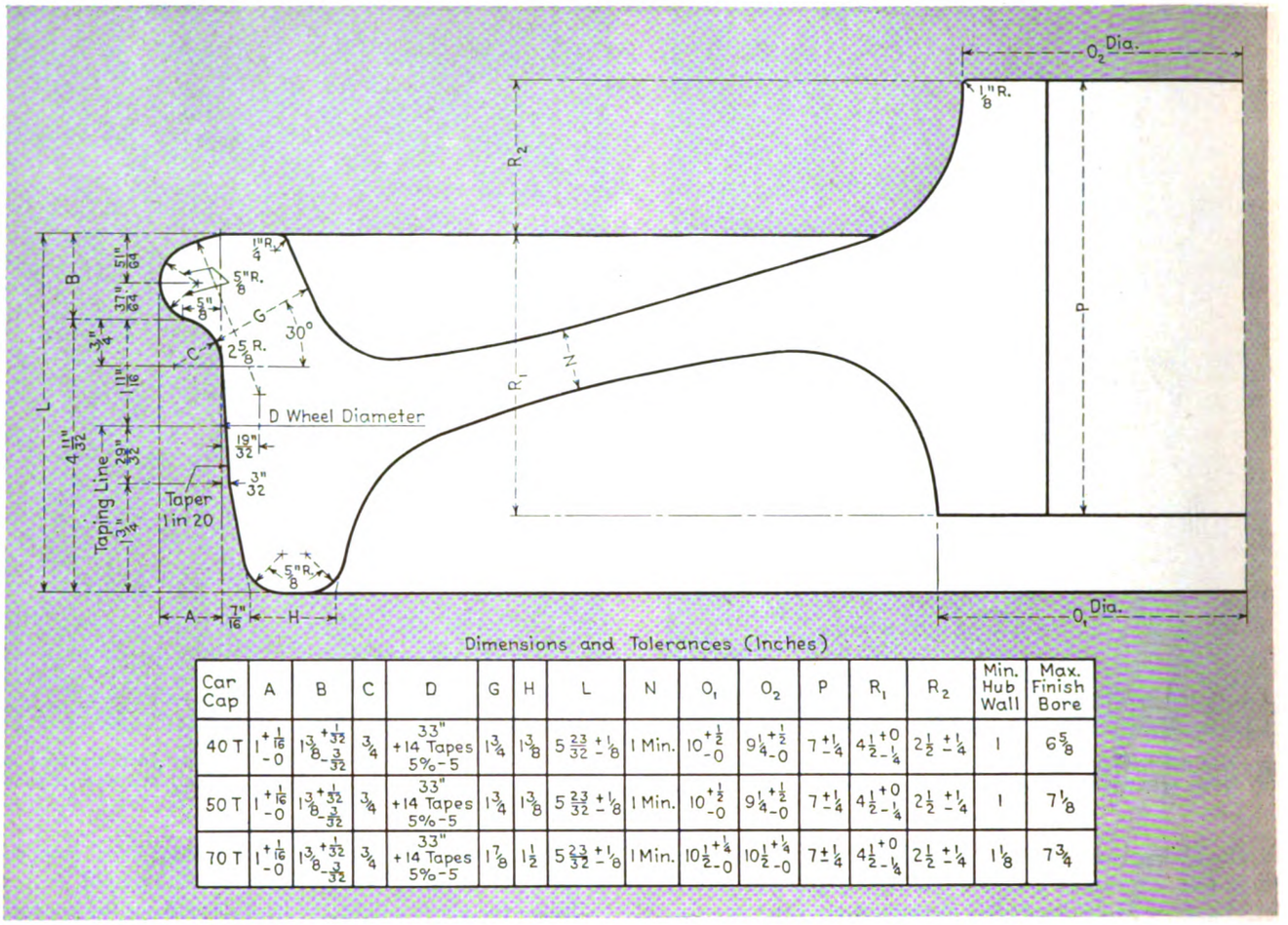
When the steel is ready to be tapped from the furnace (at a temperature of about 3,000 degrees F), it is drained into a teapot-type reservoir ladle. From there it is transferred to bottom-pour ladles, each holding enough metal for three wheels. Then, at a temperature ranging between 2,830 and 2,760 degrees, it enters the mold by gravity through a specially designed feeding head at the center. Approximately 15 seconds are required to fill each mold.

In foundry terminology, a "gate" is an opening through which molten metal enters a mold. "Risers" are reservoirs of hot metal designed to "feed" the casting as it solidifies and thus prevent shrinkage voids. A unique gating arrangement, originating from the center feeding head of the wheel mold, distributes the metal evenly to all parts of the mold cavity thereby producing a uniformly sound casting without the need for auxiliary risers. One important component in this gating system is a strainer core to prevent passage of slag into the mold.

As mentioned earlier, the chiller ring around the outside of the mold causes solidification to occur from the outer regions toward the center. The last part of the wheel to freeze, therefore, is that area directly beneath the feeding head with the consequent result that internal shrinkage is eliminated.

A sample Y-block is also poured from every heat. This block is subsequently used as the basis for physical test specimens and chemical analysis drilling—all for the purpose of arriving at a complete physical and chemical evaluation of the steel poured from that heat.

Shakeout—Following pouring, the molds travel toward the shakeout on a timed conveyor, about 55 minutes being required for complete solidification to take place. After the proper time interval, the large hub riser



Dimensions and Tolerances (Inches)

Car Cap	A	B	C	D	G	H	L	N	O_1	O_2	P	R_1	R_2	Min. Hub Wall	Max. Finish Bore
40 T	$1^{+\frac{1}{16}}_{-0}$	$1\frac{3}{8}{}^{+\frac{1}{32}}_{-\frac{3}{32}}$	$\frac{3}{4}$	33" +14 Tapes 5%-5	$1\frac{3}{4}$	$1\frac{3}{8}$	$5\frac{23}{32}\pm\frac{1}{8}$	1 Min.	$10^{+\frac{1}{2}}_{-0}$	$9\frac{1}{4}{}^{+\frac{1}{2}}_{-0}$	$7\pm\frac{1}{4}$	$4\frac{1}{2}{}^{+0}_{-\frac{1}{4}}$	$2\frac{1}{2}\pm\frac{1}{4}$	1	$6\frac{5}{8}$
50 T	$1^{+\frac{1}{16}}_{-0}$	$1\frac{3}{8}{}^{+\frac{1}{32}}_{-\frac{3}{32}}$	$\frac{3}{4}$	33" +14 Tapes 5%-5	$1\frac{3}{4}$	$1\frac{3}{8}$	$5\frac{23}{32}\pm\frac{1}{8}$	1 Min.	$10^{+\frac{1}{2}}_{-0}$	$9\frac{1}{4}{}^{+\frac{1}{2}}_{-0}$	$7\pm\frac{1}{4}$	$4\frac{1}{2}{}^{+0}_{-\frac{1}{4}}$	$2\frac{1}{2}\pm\frac{1}{4}$	1	$7\frac{1}{8}$
70 T	$1^{+\frac{1}{16}}_{-0}$	$1\frac{3}{8}{}^{+\frac{1}{32}}_{-\frac{3}{32}}$	$\frac{3}{4}$	33" +14 Tapes 5%-5	$1\frac{7}{8}$	$1\frac{1}{2}$	$5\frac{23}{32}\pm\frac{1}{8}$	1 Min.	$10\frac{1}{2}{}^{+\frac{1}{4}}_{-0}$	$10\frac{1}{2}{}^{+\frac{1}{4}}_{-0}$	$7\pm\frac{1}{4}$	$4\frac{1}{2}{}^{+0}_{-\frac{1}{4}}$	$2\frac{1}{2}\pm\frac{1}{4}$	$1\frac{1}{8}$	$7\frac{3}{4}$

(feeding head) is detached from the casting by cracking open the mold. Shortly thereafter the solidified wheel, still red hot, is removed from the mold in an automatic shakeout which is controlled by pushbuttons and photo-electric eyes.

Sand travels by belt conveyor back to storage bins to be reclaimed for further use. Upon emerging from the shakeout cabinet, the wheel is sandblasted, and the pouring gates in the hub bore are removed.

The wheel is now ready for annealing and heat treating. Placed in an insulated, unit-type annealing pit after shakeout, the wheel is permitted to cool slowly to a temperature no greater than 1,000 degrees, a process requiring perhaps 10 hours. Each pit holds twelve wheels.

Following annealing each wheel is subjected to an electronically controlled, two-stage heat treatment. This refines the grain structure and spherodized the carbides in order to realize the full degree of wear resistance and toughness inherent in the metal. Presently used for this purpose are two car-bottom type furnaces, each with a capacity of 72 wheels in 24 hours. Installation of additional furnaces will be completed in the latter part of June.

Fifteen minutes after wheels are taken from the heat treating furnaces, the hub of each wheel is cooled for five minutes by means of a specially developed water spray device. This operation induces favorable stress distribution as well as providing easy machinability.

As with any heat treated casting, the X-2 wheel must be cleaned prior to final inspection. A shop blast machine is utilized for that process. The machine effectively removes heat-treating scale and simultaneously peens the surface to an attractive luster.

As an added precaution during the early pilot stages of plant operation, a representative wheel from each heat was submitted to Magnaglo examination. Magnaglo is a patented process for detecting discontinuities in ferrous materials. These early precautionary examinations served merely to demonstrate that the X-2 wheel did not suffer significantly from plate defects susceptible to Magnaglo detection.

Machining—From the shot blasting station the wheel proceeds by gravity conveyor to the machining area. Two fully-automatic vertical turret lathes are presently set up for wheel machining and two additional are scheduled for future installation. In a single, cyclic operation requiring about 12 minutes, each wheel is automatically rough bored, finish machined on front hub and rim face, and precision turned to standard AAR steel wheel tread and flange contour with a secondary taper.

After machining, the wheel continues by gravity conveyor to the inspection station. Here it is weighed, stencilled to show tape size, and then meticulously examined by the resident inspector to check conformity to dimensional requirements as well as adherence to rigid standards of physical soundness and appearance. Finished wheels roll on a gravity monorail out to the shipping platform where they are picked up by lift truck and placed in storage. The inspector reviews all chemical and physical test records and heat treatment charts before releasing wheels for shipment.

Ideas for the Car Repair Man...

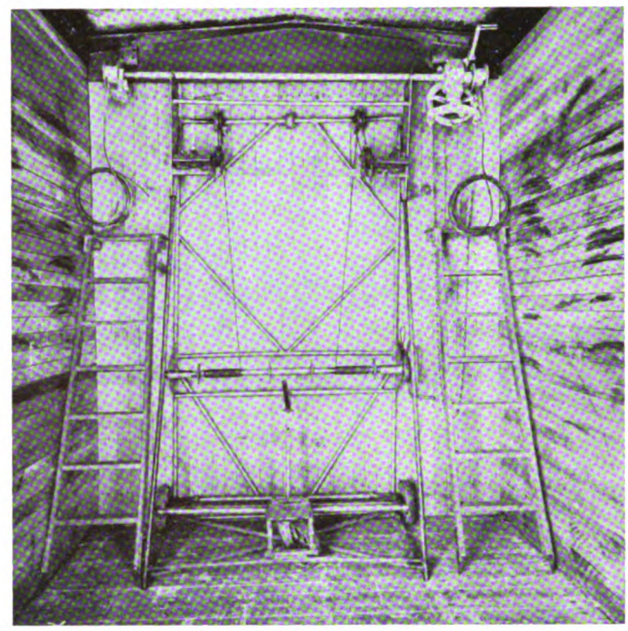
LIFTER FOR AUTO LOADER HOIST.—The application of Evans auto-loader hoists in automobile-box cars is greatly facilitated by means of the device illustrated. This is a welded tubular A-frame with one pair of legs vertical to fit closely up against the car end and the other legs diagonal for purposes of bracing and strength.

The frame is about 6 ft. wide by 9 ft. high and carries a sliding member with two upward-extending brackets notched at the top to support the auto-loader horizontal bar and keep it from rolling or slipping off the brackets.

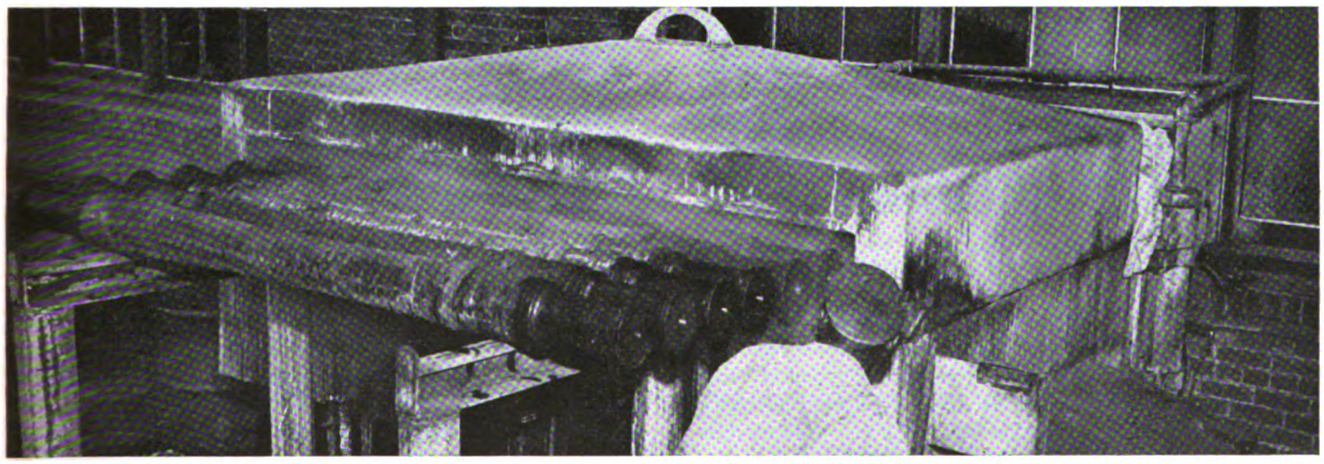
The sliding member, or carriage, rides up and down the diagonal legs of the A-frame, as controlled by a simple hand-operated ratchet arrangement with duplicate small wire cables extending over suitable pulleys to the wind-up shaft. In its lowest position, the carriage is at a convenient height for easy application of the Evans hoisting unit and, in its highest position, the carriage supports the hoist horizontally about 10 ft. high and presses it against the holding brackets previoulsy welded in place on the upper car end.

The holding bolts are then easily applied by one man on each side ladder who can bolt the hoist quickly and safely in place without having to hold it manually while lining up holes, inserting bolts and tightening nuts. The result is a definite increase in safety as well as saving of time and labor for this operation.

The A-frame is relatively light in weight and supported on three small truck wheels for easy portability, the center wheel having a slight vertical adjustment by means of the hand lever arrangement shown which permits the diagonal legs to rest on the car floor when necessary to prevent rolling. This device is used at the Southern Pacific shops, Sacramento, Cal., whenever an auto-box car building program is in progress, or for some reason an Evans auto-loader hoist has to be taken down or re-applied.

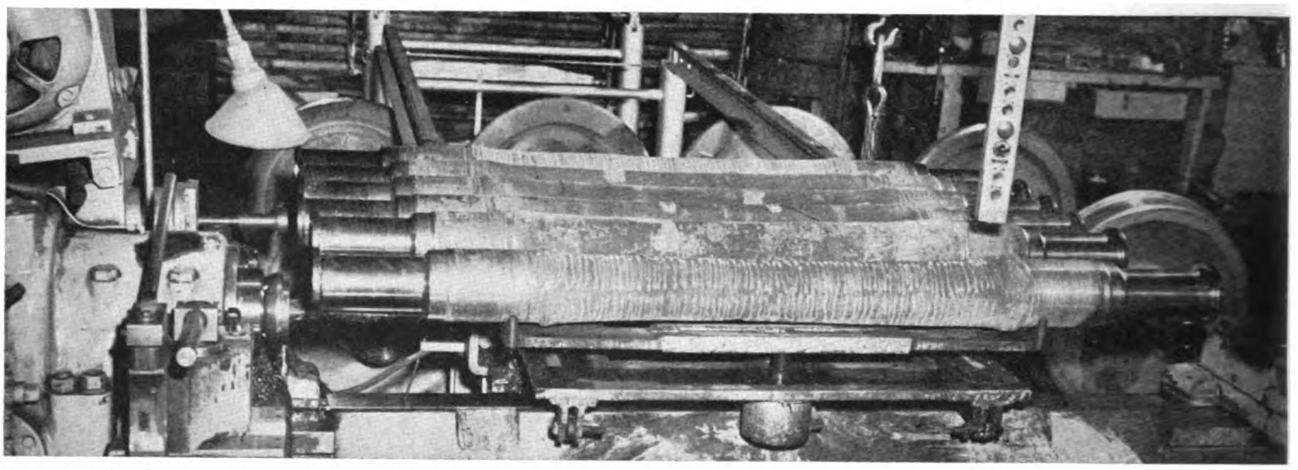


A—frame lifting device used in applying Evans loader hoists in auto-box cars.



Axles are cleaned under a hood outside the shop.

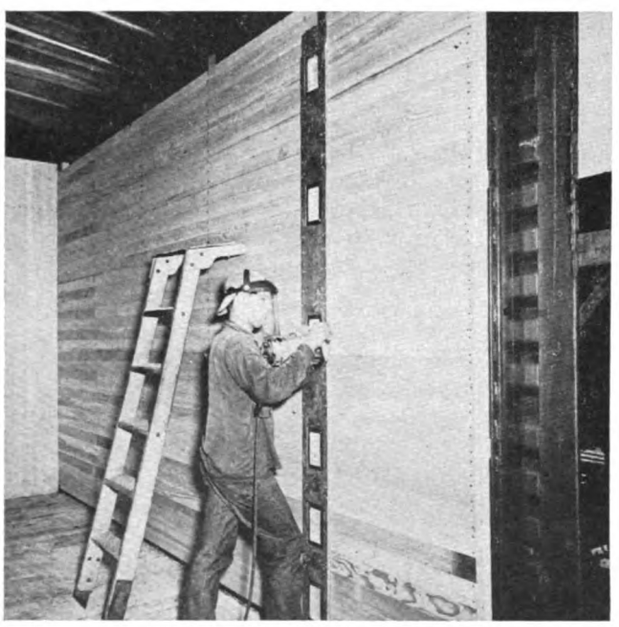
AXLE CLEANING AND HANDLING.—Cleaning the preservative from axles at the Union Pacific's shops in Portland, Oregon, has become a simple operation. They are loaded onto a rack outside the shop, six at a time, with a lift truck. From the rack, they roll into the cleaning compartment, where steam and cleaning solutions work on them for about 20 minutes. When released by the operator, they roll through the window and down in-



From the cleaning rack outside the window, axles roll down an incline to the lathe.

clined rails to the axle lathe inside the shop. It used to take one man two hours to clean six axles by hand.

At the lathe, a pneumatically-operated carriage lifts and places them in position for turning. They are removed from the lathe and transferred to the mounting press by a crane.



How template is applied in car while routing out recesses in inside lining for the application of Keystone loading anchors.

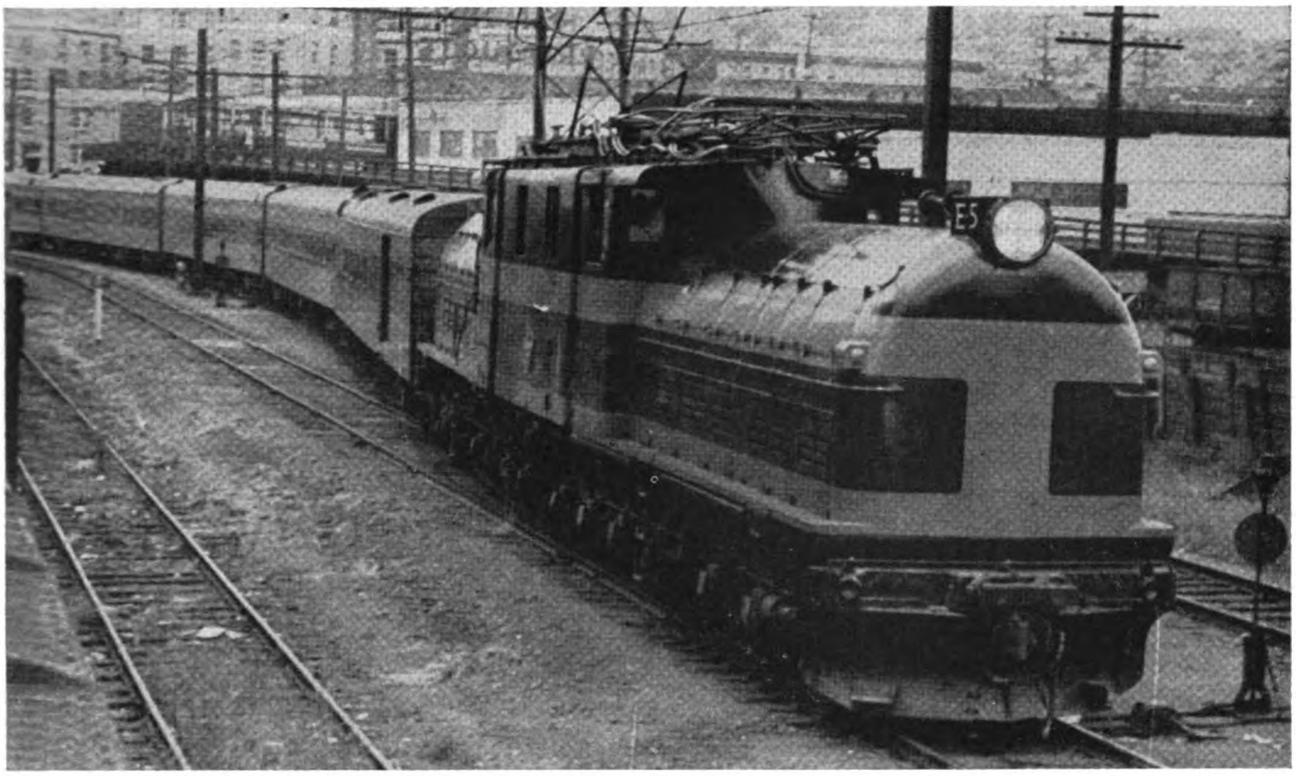
Keystone loading anchors riveted in place. Two bottom anchors are still to be applied.

TEMPLATE FOR LOADING ANCHORS.—An interesting and efficient method of applying Keystone loading anchors to the interiors of box cars on the assembly line is illustrated. The template is made of aluminum with steel inserts at the rectangular openings for greater durability in guiding the 2-hp electrically-operated routing machine. The template is brought to the desired location, a bracket at the top hooking over the top lining board to assure the correct vertical position. The template is then positioned horizontally in line with the vertical sidepost and nailed lightly in place with 4 nails.

Operation of the router automatically and accurately cuts desired recesses in the inside lining to accommodate the Keystone loading anchors which are a close fit and driven home with a hand hammer. Each anchor itself serves as a guide for drilling rivet holes through the sidepost flange. The application of Pax Speedy blind rivets holds the anchors securely and permanently in place.

An educational program, intensive in character, is evidently necessary among shippers to assure wider acceptance and use of loading anchors which are available in several different types and with modern steel strapping, do much to reduce lading damage and reduce repair costs.

ELECTRICAL SECTION . . . . . .



The Olympian Hiawatha Speedliner pulled by a rebuilt gear-less locomotive leaving Seattle, Wash.

Old Electrification Meets All Comers

By L. WYLIE
Electrical Engineer
Chicago, Milwaukee, St. Paul & Pacific
and A. G. OEHLER
Electrical Editor, Railway Locomotives & Cars

By making substations automatic, increasing line voltage and making other improvements, the Milwaukee electrification is meeting the greatly increased present-day demands for speed and power

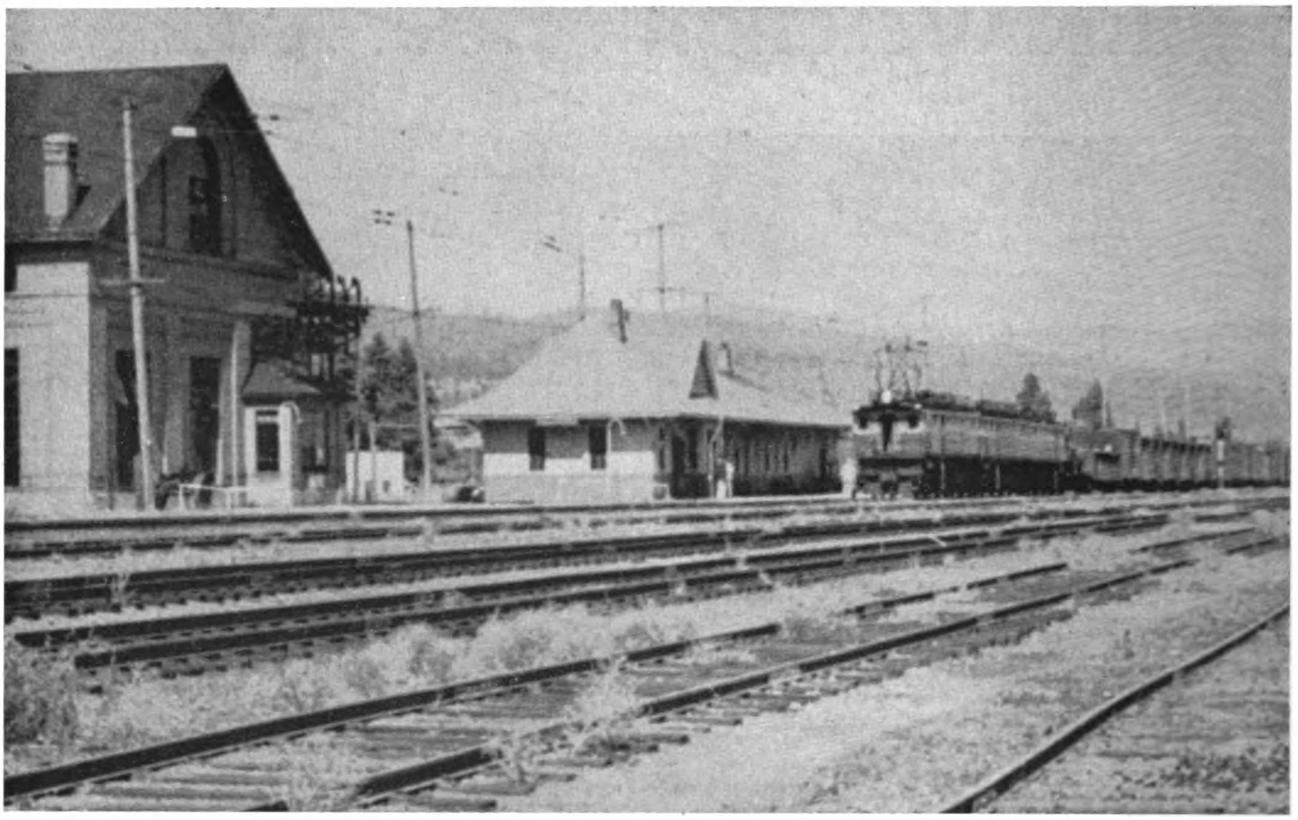
■ Railroad electrification, generally considered since the advent of the diesel-electric locomotive to be economically feasible only under conditions of extremely heavy traffic, is paying its way on the Milwaukee.

By stepping up trolley distribution system voltage, improving power conversion substation equipment and arranging its automatic control, providing modern facilities for maintenance and repair of electric locomotives, overhauling electric locomotives, purchase of 12 heavy-duty, high-speed locomotives, securing a reduction in the rate paid for electric power, and by making other improvements, the Milwaukee is keeping its electrification, in spite of age and relatively light traffic, in pace with the diesels in efficiency and economy.

This situation has been possible because, while most of the electrification equipment has now reached or exceeded the assumed life, the actual condition of the equipment is such as to meet satisfactorily the greatly increased present-day demands for speed and power. This has been accomplished by changes and improvements in equipment and in operation listed here.

1. Trolley voltage has been raised from 3,000 to 3,400 volts at substations to compensate for voltage drop in the trolley distribution system. This increase was obtained by inserting soft iron shims under the main field poles of the d-c generators to reduce the air gaps from 3/8 in. to 3/16 in., thereby increasing the flux density of these synchronous speed machines. Some additional shunt field excitation of the generators is also required. The increase in trolley voltage has materially increased locomotive output without increasing electrical troubles on the line, locomotives or substations.

2. Substation equipment has been rehabilitated and



A three-unit locomotive pulls a freight train through Cle Elum, Wash. A line tower car may be seen in front of the substation

TABLE 1—COST PER 1,000 GROSS TON-MILES FOR ELECTRIC POWER AND ELECTRIC LOCOMOTIVE MAINTENANCE

FREIGHT TRAIN OPERATION ROCKY MOUNTAIN AND COAST DIVISIONS

STATISTICS	1947	1948	1949	1950	1951	1952	1953
Thousands GTM	3,296,459	3,354,933	3,193,389	3,520,283	3,416,041	3,363,201	3,159,959
KWH per MGTM	36.9	37.6	37.1	37.7	39.9	40.0	39.0
Cost per KWH							
Electric Power	$.005422	$.006392	$.006435	$.005940	$.005470	$.005390	$.005380
Substation—Operation	.001600	.001660	.001837	.001832	.001819	.001950	.002020
Substation—Maintenance	.000511	.000389	.000411	.000398	.000590	.000543	.000695
Power Line—Maintenance	.000914	.000933	.001147	.000833	.000945	.001186	.001184
TOTAL	$.009447	$.009374	$.009830	$.009003	$.008824	$.009069	$.009279

TABLE 2—AVERAGE PERFORMANCE OF 20 HEAVY TONNAGE TRAINS, ROCKY MOUNTAIN DIVISION

HANDLED BY CLASS EF-4 LOCOMOTIVES, SEPTEMBER 1953, HARLOWTON, MONT. TO AVERY, IDAHO

Train No. 263	Distance Miles	Number of Trains	Tons	Total Time* Hr Min	Terminal Delay Hr Min	Time Between Terminals Hr Min	Road Delay Hr Min	Running Time Hr Min	Miles per Hour
Harlowton—Three Forks	114.2	20	3,418	5-38	1-12	4-26	0-51	3-35	31.9
Three Forks—Deer Lodge	112.1	20	3,452	6-09	0-53	5-16	1-14	4-02	27.8
Deer Lodge—Alberton	110.8	20	3,553	5-47	2-55	2-52	0-10	2-42	41.0
Alberton—Avery	100.3	20	3,519	4-54	0-36	4-18	0-33	3-45	26.7
Harlowton to Avery	437.4	20	3,486	22-28	5-36	16-52	2-48	14-4	31.1
Train No. 264									
Avery—Alberton	100.3	20	5,715	7-23	2- 1	5-22	0-53	4-29	22.4
Alberton—Deer Lodge	110.8	20	5,783	5-22	0-47	4-35	0-35	3-52	28.6
Deer Lodge—Three Forks	112.1	20	5,295	8-28	2-37	5-51	1-13	4-38	24.2
Three Forks—Harlowton	114.2	20	5,492	7-12	1-51	5-21	0-49	4-32	25.2
Avery to Harlowton	437.4	20	5,571	28-25	7-16	21-09	3-38	3-38	25.0

*Time of arrival at one terminal to arrival at next terminal.

some manually operated substations have been converted to automatic operation.

3. Adequate shop facilities have been provided for maintenance of electric locomotives.

4. Troublesome spring cushion driving gears have been replaced with solid gears on 80 locomotive units. This change has improved locomotive performance, decreased the cost of traction motor maintenance and reduced the cost of maintaining the gear drives to a fraction of the former cost. Present electric locomotive maintenance costs are less than the maintenance costs of diesel-electric locomotives in the same service over any extended period of time.

5. Electric locomotives have been thoroughly overhauled for the first time. Some have been operated for 35 years, and have rolled up individual mileages of about two million miles.

6. Power line maintenance methods have been improved at the same time reducing the cost of line maintenance.

7. By using more horsepower per train, a great increase in both train tonnage and average train speed has resulted.

8. Revision of power contracts has secured a flat rate of approximately ½ cent per kw-hr. Power paid for by the railroad is metered at substations at 2,300 volts.

A diesel-electric locomotive will develop approximately 10 kw-hr from one gallon of fuel oil—thus, if the cost of fuel is 10 cents per gallon, power cost for the electric locomotives, when line and conversion costs are included, is less than the cost of fuel would be for diesels (see Table 1).

As a result of these changes and improvements, the two electrified sections, 440 and 220 miles of line, respectively, are meeting stepped up operating requirements at a cost which justifies the continuation of electric operation.

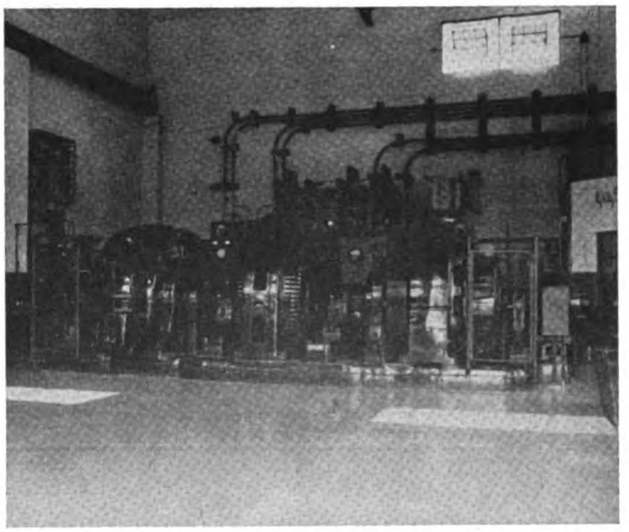
Transmission and Distribution Performance

At least 90 per cent of the original 40,000 poles and 60 per cent of the original cross arms and attachments in the transmission line and distribution system are still in place. All poles have been stubbed with pressure-treated creosoted fir stubs, and all original wooden guy anchors have been replaced with reinforced concrete anchors.

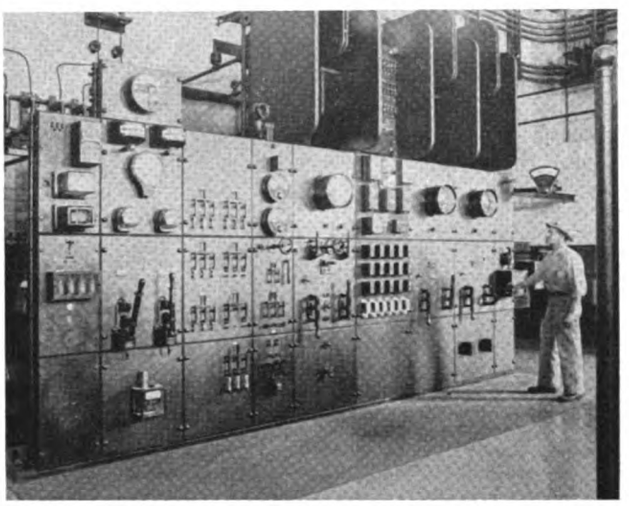
A considerable amount of corrosion of the trolley overhead has been experienced in all yards where steam locomotives previously operated, as well as from the summit of the Cascade range to Seattle and Tacoma. In this territory non-corrosive material has been installed where most needed. The rate of corrosion is being reduced as the use of steam locomotives is discontinued and as more non-corrosive material is applied. The original diameter of the 4-0 grooved copper contact wire was 0.482 in. The average diameter of this contact wire after 35 years of service is now approximately .430 in.

Contact wire is not removed from the line because of wear until it is reduced to a diameter of .360 in. By careful attention to pantograph maintenance and lubrication of trolley wire and pantograph shoes, the life of the contact wire can apparently be extended indefinitely.

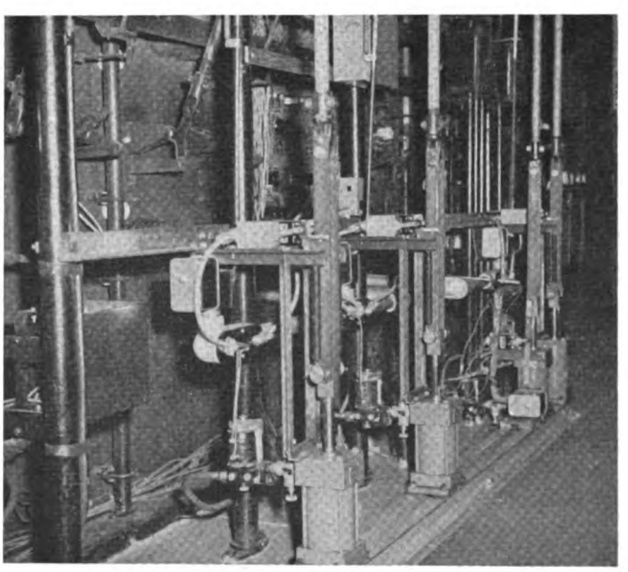
Many improvements in line maintenance methods have been developed, the latest of these being the highway-rail tower car truck. It may be run on the highway to any rail-highway crossing, where the retractive flange wheels are lowered by hydraulic cylinders so the truck can run to the work point on the rails. Practically all types of line main-



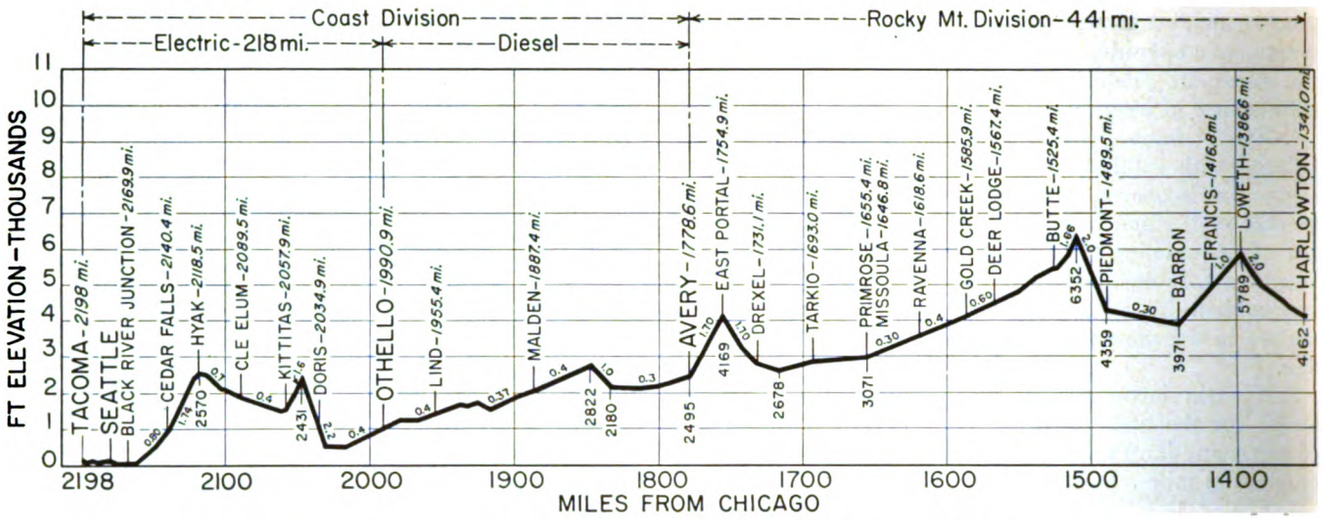
Motor-generator sets in the substation convert 2,300-volt 3-phase a-c power to 3,400 volts d-c.



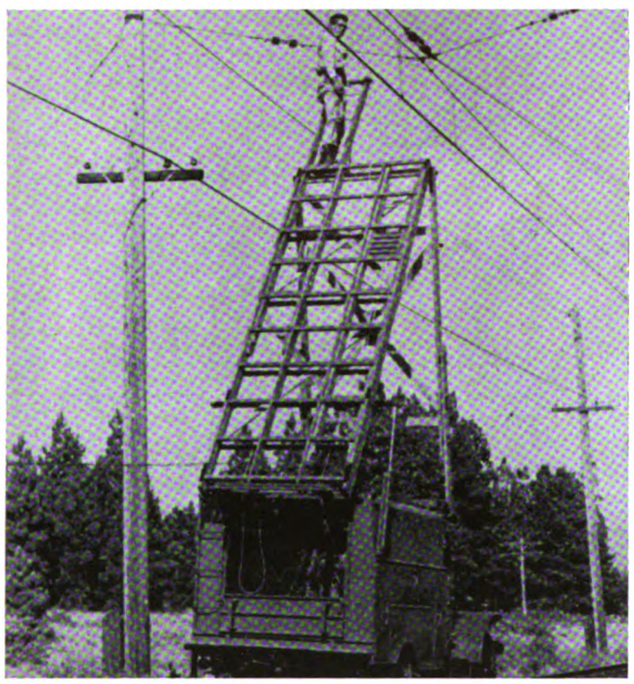
Manual switchboard in the Cle Elum, Wash. substation.



Substation's machinery is started, put on the line, taken off the line, and stopped automatically by electro-pneumatic operating mechanisms applied to the original breakers and switches.



Profile of the Milwaukee's electrified sections.



A highway-rail line maintenance car on the track with the tower or ladder raised.

A maintenance car leaves the highway for the rails.

tenance work may be performed with this truck. The work tower, or ladder, is made of treated spruce which has excellent insulation properties so that it may be used for "hot" work.

Of the 46 100,000/2,300-volt power transformers in substations, only 8 have been damaged to such an extent that new coils and complete overhauling were required. Most of the 46 synchronous, motor-driven generating sets have had minor repairs, but only about 25 per cent of these machines have been completely rewound.

Three Substations Now Automatic

There are 22 power-conversion substations, each of which was originally manually operated by three men, working three shifts. Three of these substations have been made automatic, and a number of the remaining stations will be converted to automatic operation.

This conversion is accomplished by use of relay-controlled electropneumatic mechanisms applied to existing switches and circuit breakers, and actuated either locally or by remote control. If desired, these mechanisms can be operated by relays adjusted to respond to the contact system voltage at the substation. When an overload persists for 15 minutes, the circuit breakers are opened, and machines shut down. When an approaching train causes reduction in line voltage, the motor generator sets are automatically started and connected to the line. To augment the regenerative capacity of some substations, power absorbing grids are used to assist with extremely heavy loads of short duration.

The amount of traffic handled over a 35-year period on the electrified sections is shown in Table 4 on next page.

TABLE 3—MILWAUKEE ELECTRIC LOCOMOTIVES NOW IN SERVICE

Number	Type	Description
5	EP3	Westinghouse passenger
5	EP2	General Electric bipolar passenger
2	EP4	General Electric #750-type passenger
2	EP1	General Electric 2-unit geared passenger
4	ES2	General Electric 80-ton switchers
10	EF4	General Electric #750-type freight
76*	EF1-2-3-5	General Electric geared freight

*Units—used 1, 2, 3 or 4 to a locomotive.

Interior of the electric shop at Deer Lodge, Mont.

In 1918, the schedule time for Train No. 16, the fastest passenger train between Avery, Idaho, and Harlowton, Mont., was 15 hr. The present schedule for that train, the "Olympian Hiawatha," is 10 hr 30 min.

In June 1918, the schedule for Train No. 64, the eastward time freight between Avery and Harlowton, with 2,800 tons trailing, the maximum tonnage at that time, was 36 hr 45 min. Today, with 5,800 tons trailing, the schedule for this time freight is 23 hr 30 min, and the train is making this schedule. Not all of the saving in time on this schedule is due to electrification, but the electrification system has been able to keep pace with changing times.

Passenger and freight train schedules, and freight train tonnage on the Coast division have been improved in like proportion.

Of the 62 bipolar locomotive traction motor armatures (60 in service and 2 spare armatures), there are still 10 armatures with original windings which have never had a failure of any coil. A record of the failures which have occurred on these armatures indicates that about 80 per cent have been caused by mechanical damage.

Majority of Armatures Rewound

Most of the armatures on the other locomotives have been rewound. Some of this was done on a program basis to remove windings which were assumed to be approaching the end of their life or to remove windings which had been damaged mechanically, or where moisture or dirt have caused an insulation failure.

Most of the classified repairs to electric locomotives are now being made in the railroad's shops located at Milwaukee, Wis.

All other locomotive maintenance functions including rewinding of motors, is done in the railroad's completely re-equipped shops at Deer Lodge, Mont., or in the shops at Tacoma, Wash.

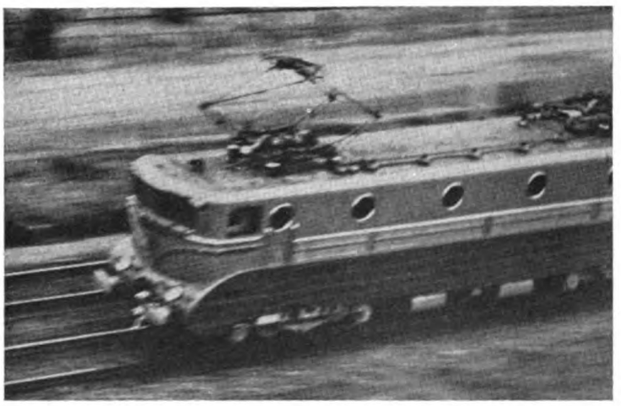
A few locomotives have been scrapped, and 12 new locomotives were purchased within the past few years. Four electric-geared freight units were converted to two two-unit locomotives for passenger service.

From the results obtained to date from the program of classified repairs to electric locomotives which has been instituted, it is apparent that this program will materially improve performance and reduce maintenance costs to such an extent that the cost of repairs will be amortized in a relatively short period.

TABLE 4—TRAFFIC AND POWER CONSUMPTION, 1916 to 1953 INCLUSIVE

Gross ton-miles	95,710,107,000
Passenger car-miles	239,849,335
Electric power consumption (at 2,300 volts)	5,230,094,926
Cost of electric power	$38,960,275*

*Varying prices for power have been paid over this period. The present rate on the Rocky Mountain division is a flat rate of 0.536 cents per kwh and on the Coast division it is 0.5 per kwh plus a charge for hourly power demand 5 to 6 p.m., 5 days per week during the period October 16 to February 15, inclusive, making the average yearly cost per kwh approximately .546 cents per kwh.



Airplane view of locomotive BB 9004 as it broke the world's rail speed record by reaching 207 mph.

Locomotive CC 7107 at the head of an express train on one of its regular runs.

Electric Locomotives Attain 207 MPH

Tests on French National Railways develop new information on very high-speed operation

■ Last year, on February 21, 1954, an electric locomotive of the French National Railroads, the CC 7121, running between Dijon and Beaune, broke the world's rail speed record by reaching 151.6 mph. This locomotive pulling 3 passenger cars, was one of a series of 60 locomotives built since 1949.

On March 28 and 29, 1955, the French Railroads broke their own record with two electric locomotives, the CC 7101, another in the same series as the 1954 record breaker, and the BB 9004. For the test runs, both these locomotives pulled the same three passenger cars, weighing 111 tons. The CC 7107 reached 198 mph, and the BB 9004 set the mark of 207 mph.

Tests were held on a 40-mile straight section of track in southwest France between Bordeaux and Dax, where a 1,500-volt, d-c system of electrification has been in operation since 1927. It was felt that the 40-mile stretch would allow sufficient distance for acceleration to high speed and braking, a special problem for high speed runs since applying brakes while traveling more than 125 mph was not considered safe. Special brakes had not been designed for the tests, and technicians decided that the windows would have to be lowered at the proper moment to create a drag. This system was used during the actual runs, and trains were successfully slowed down to safe braking speed.

Both locomotives used in the tests have been in regular service. The CC 7107, an entirely French-built locomotive manufactured by the Societe Alsthom, has two six-wheel trucks, weighs 107 tons, and is of the type which regularly makes the Paris-Lyons run at an average of 76 mph.

Put in service in 1953, the BB 9004 is the result of group cooperation between Creusot, Schneider-Westinghouse and Jeumont. It has two four-wheel trucks, weighs about 83 tons, and has about 300 hp less than the CC 7107. The BB 9004 is a prototype of the latest locomotive design developed by the French to serve its 1,500-volt, d-c lines for high speed runs. Forty locomotives of this type are under construction.

Since the lighter BB 9004 costs about 25 per cent less than the CC 7000 series, the French were eager to discover if its performance would compare favorably with the very successful CC 7000 locomotives.

To adapt the transmissions to the high speeds, slight modifications were made in the gears of the two locomotives, and solid wheels were used to avoid the effects of centrifugal force and braking on tired wheels. It was estimated that the locomotives would develop about 10,000 hp at 185 mph, and a special pantograph was designed to collect 4,000 amp at high speed. An aviation wind tunnel was taken over to allow examination of how a 185-mile wind would effect pressure of the pantograph on the catenary. Elaborate safety measures were taken, including complete shop tests of all moving parts, which were made to revolve at a speed simulating 260 miles per hour in actual operation.

The three passenger cars attached to each locomotive for the speed tests were virtually unchanged. However, it was necessary to remove all seats from the first car to accommodate the instruments and equipment used to measure the effects of speed on all parts of the train and track. The test train carried a piezo-electric quartz accelerometer to test stability and lateral strain, registered on cathodic oscillographs, various precision instruments to measure speed, time, and line voltage, plus, as a final touch, a periscope through which engineers could watch that the pantograph was in constant contact with the catenary. The rear of the last passenger car was specially streamlined to assure the best possible air flow.

The CC 7107 was tested on March 28 and the BB 9004 on March 29. After 13 miles, the CC 7107 was running at 180 mph, and was allowed to reach 198 mph. The BB 9004 accelerated at about the same rate, but climbed to 207 mph. Soon after the BB 9004 reached record speed, trouble developed in its rear pantograph, a result of the heat created by high speed. The front pantograph was raised, and the rear one lowered while the train was traveling at 198 mph. Although the CC 7107 apparently did not affect the rail, a standard French track unaltered for the tests, it was found that the BB 9004's top speed of 207 miles caused slight damage. A principal reason for conducting the tests was to determine if guiding trucks are necessary for high speeds, and the results indicate they are not. Both locomotives developed 12,000 hp.

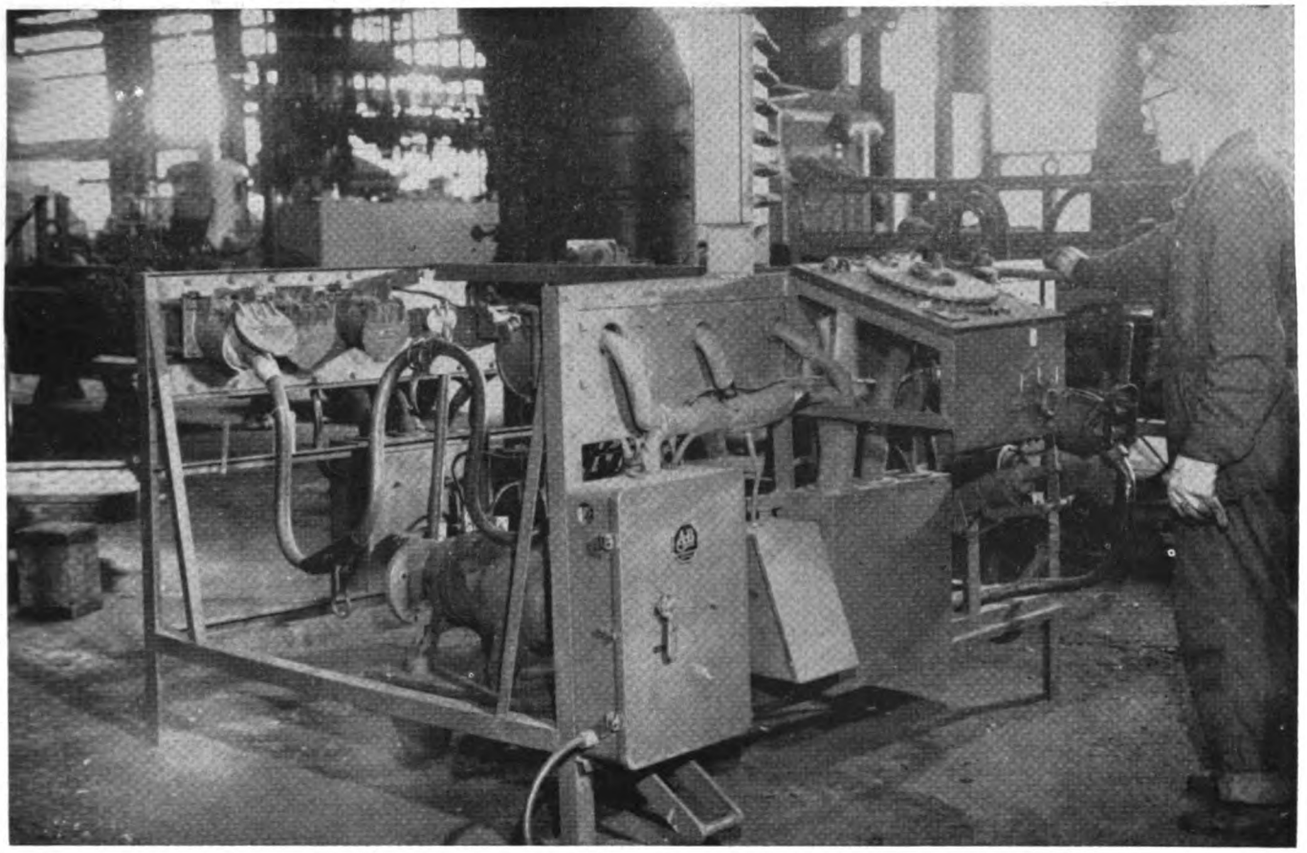


Fig. 1—The Rock Island jumper tester in operation

Rock Island Develops Jumper Tester

■ While diesel locomotive jumper cables, both m-u and brake, are oscillated by a motor drive, tests for current carrying capacity, shorts between conductors or grounds, and for quality of insulation are made on a jumper tester developed in the Silvis, Ill., shops of the Rock Island. The machine is also equipped for checking sequence of connections.

Three sources of power are used for the different tests. One provides 85 amp at about 8 volts for load testing, another is 500 volt d-c for insulation resistance testing and the third is 110-volt a-c power for sequence testing. Any one of the three may be selected by means of the three-point switch on the front of the control box shown at the right in the above illustration.

The 85-amp, 8-volt source is an auto transformer which was once a 50-hp motor starter. A resistance in series with the secondary limits the current to 85 amp. The 500-volt d-c source for insulation testing is a step-up transformer and a full-wave tube type rectifier. Interlocks prevent applying the wrong kind of power for any one of the tests. During the insulation and current capacity tests, a motor-driven oscillator moves the cable back and forth at 30 oscillations per minute through an arc of 14 inches.

For the current capacity tests, the jumper is plugged into a receptacle at the front of the testing rack and another receptacle at the rear. A short-circuiting switch is used to connect all the conductors of the cable together at the rear receptacle.

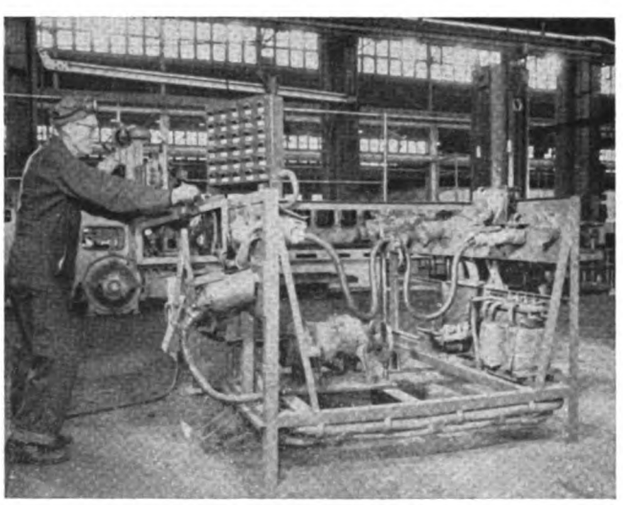


Fig. 2—A side view of the tester showing the sequence lights in front of the operator and the motor-driven cable oscillator

The 8-volt, 85-amp source of power is applied in turn to each jumper conductor at the front end by ratcheting the selector switch on top of the tester control box, from one conductor to another. When the connection to a conductor is made, the 85 amp current flows for 8 seconds when it is cut off automatically by an out-fire relay taken from a Vapor steam generator. The value of

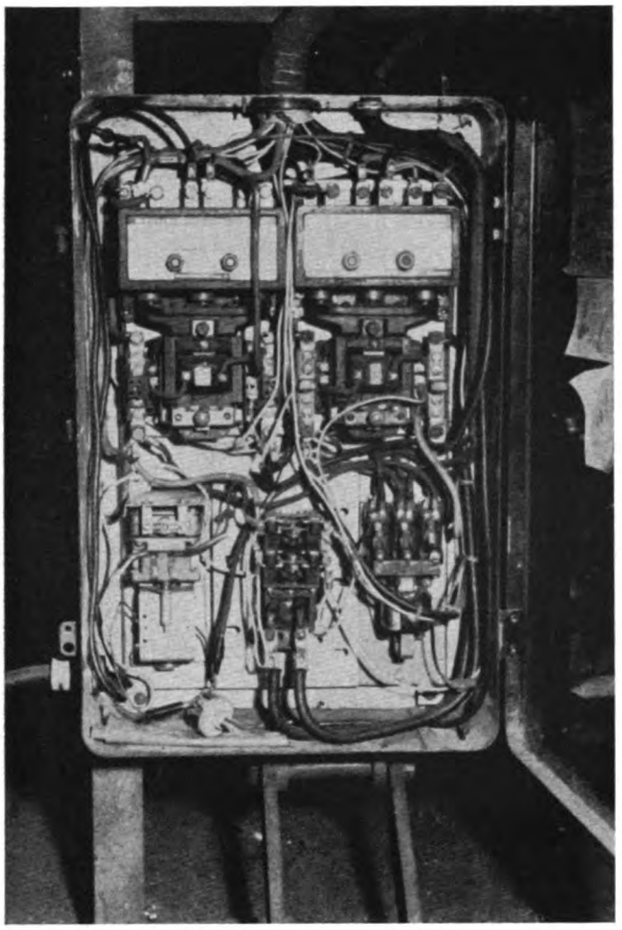


Fig. 3—Relay and connection panel which is located as shown at the lower left in Fig. 1

time and current were selected so that if 14 or more strands of 105 stranding are unbroken in the conductor, they will burn off, and open the circuit. A timer light comes on as each conductor comes under test, and goes out when the out-fire relay opens the circuit. An OK circuit light also comes on when the circuit is closed, and if it goes out before the timer light, it indicates an open or burned-off conductor.

For the insulation and ground test, the connections at the rear receptacle are left open and 500 volts d-c is applied to each conductor in turn by the selector switch. A milliammeter in the lower left-hand corner of the control box, shows the amount of leakage current from each conductor, to ground or to other conductors, as the selector switch is notched around.

If the current flow exceeds ½ milliampere, a ground indicating light shows. The value of ½ milliampere is equivalent to 1 megohm resistance and is the limit for acceptable insulation.

For the continuity test, one end of the jumper conductors is connected in turn to the 110-volt a-c source. The other ends of the conductors are connected by means of a switch to the lights in the panel at the top of the machine in front of the operator,—one light for each conductor. Then as the selector switch is ratcheted from one point to the next, each light shows in turn if all connections are correct.

All types of electric brake and m-u jumpers are tested in the machine.

Westinghouse

Four 100-hp motors with current-limit control driving through flexible couplings provide acceleration and dynamic braking rates of 2.5 and 3.0 miles per hour per second

By W. L. Barclay
Transportation Engineering Supervisor
Westinghouse Electric Corporation
New York, N. Y.

■ In 1948, the modern trend for heavy duty rapid transit equipment was established when the first of 750 new cars were delivered for service on New York City subways. These cars set new standards for passenger movement, schedule speed, acceleration and braking rates. The car body design features an attractive interior, contour seats, wide doors, fluorescent lighting and excellent riding qualities. This car has proved to be an efficient design from the standpoint of both the passenger and the operator; the passenger because he gets faster, more comfortable and more reliable transportation; and the operator because he can provide service with fewer cars at faster schedules and because of easier handling, safer operation and extension of mileage between inspections. The features called for in this design were decided on after extensive engineering studies under the former Board of Transportation and the present New York City Transit Authority by Col. H. S. Bingham and his assistants. The soundness of the basic design is attested to by six years of eminently successful operation and by the fact that essentially duplicate performance is specified for the 600 additional cars now on order and now entering service.

To the electrical equipment manufacturer the ultimate test of design sufficiency is service performance. Therefore, each electrical component on the earlier cars was subjected to the closest scrutiny, with attention directed equally to electrical and mechanical design. The results of this survey, which is based on approximately 100,000,000 car miles of operation on Westinghouse equipped cars, clearly indicated that all major electrical components successfully withstood the test of time and heavy duty service. Such design changes are largely detail refinements or the use of newly developed materials. In addition the grouping of apparatus has been changed to reduce the number of individual boxes to be mounted.

Electrical Components—Main Drive

Westinghouse electrical equipment was supplied on 375 of the 750 cars delivered from 1948 to 1950, and 300 additional cars are currently entering service. On these latest cars the major electrical components have been retained. The main drive equipment consists of: four 100-hp, 300-volt traction motors connected two in series; four separate gear units with oil lubrication and with the gear centers accurately maintained by tapered roller bearings on both

Equipped Cars For New York Subways

Side view of a complete R-16 car

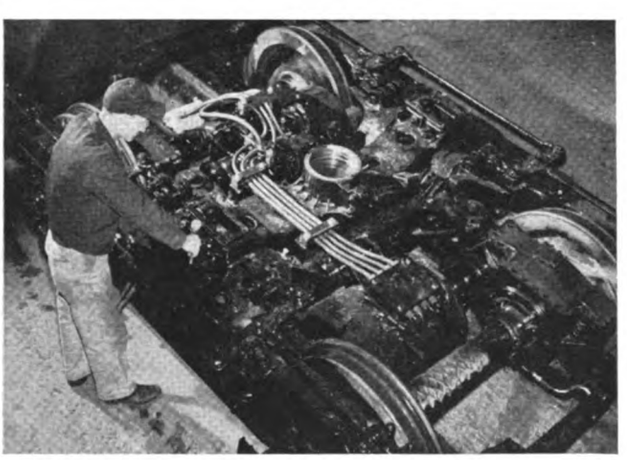
high speed and low-speed shafts, and four flexible couplings of the internal gear type connecting each motor to its gear unit.

This arrangement is superior to the older axle hung motor drive because it permits the use of the high-speed motor with its more efficient ventilation and lighter weight; because of quieter operation inherent in separate oil lubricated gear unit, and because of less unsprung weight on the axle with consequent improvement in riding qualities. While there is no essential difference in outward appearance of the drive components for the new cars, a number of advances have been made in detail design. Among these are an improved means of obtaining an accurate "Dynetric" balance of the motor armature, improved motor insulation through the use of new materials and processes, and slight modifications of the gear case design to facilitate disassembly and to prevent oil leakage.

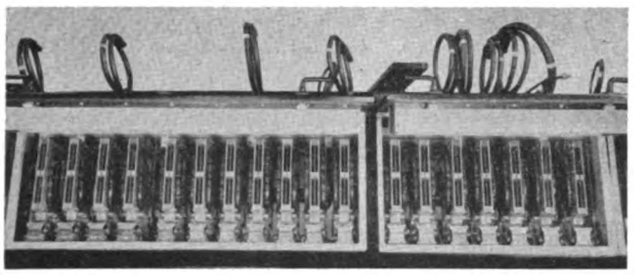
Interior view of an R-16 car

Control

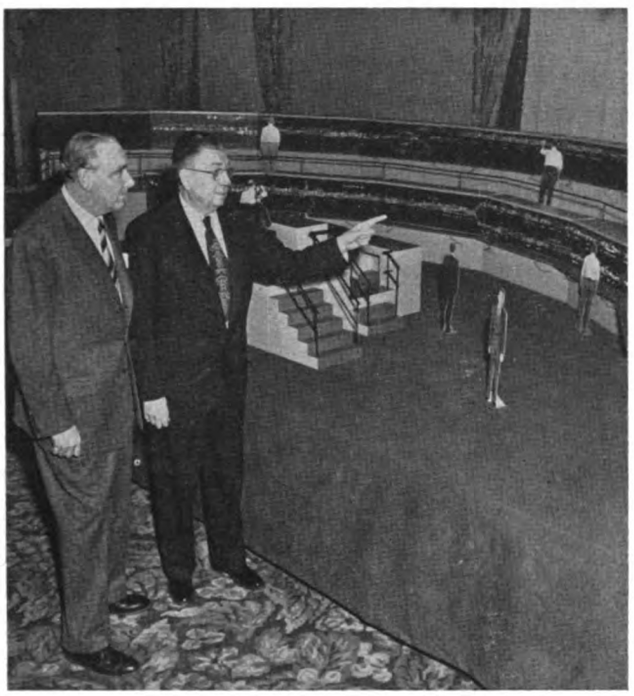
On both the 1948 cars and the current order the control equipment provides series-parallel control, field shunting for the high speed power connection, and dynamic braking. The acceleration and dynamic braking rates are 2.5 and 3.0 respectively. To accomplish this both groups of Westinghouse-equipped cars make use of electro-pneumatic unit switches and external self-ventilated ribbon resistors of rugged construction for acceleration and dynamic braking notches. Field control is obtained by means of a multi-notch cam controller which provides smooth transition between full field and short field notches and maintains commutation stability of the motors while field strength changes are taking place. The transition from series to series-parallel connection of the motors is made by the bridging method which maintains full motor torque during transition. This is of special importance wherever high accelerating rates are used in order to maintain smooth continuity of rate for the comfort of the passengers. Notching for both acceleration and braking is ac-



Top view of complete R-16 Truck with motor and gear unit



Side view of Westinghouse package control unit with cover raised



A model of the centralized traffic control board which will provide pushbutton control for the entire IRT system of train movements and signals. Shown with the board are Col. Sidney H. Bingham (right) executive director and general manager, New York Transit Authority and Edward O. Boshell, chairman and president, Westinghouse Air Brake Company, which company is supplying the equipment through its Union Switch and Signal Division

complished by interlock progression of switches under the control of a limit relay. This system has the advantage of reliability and simplicity with the result that inspection, sequence checking, trouble shooting, etc., are easily understood and present no problems to maintenance or operating personnel. From the maintenance standpoint the unit switch construction lends itself to orderly shop procedures without the necessity of handling or dismantling large pieces of control equipment. Numerous refinements have been incorporated to further improve performance and ease of maintenance. One of the principal items in this category is the grouping of virtually all the undercar control together into a single unit containing line switches, unit switches, relays, motor generator control and pneumatic devices for coordinating the air brake with dynamic braking.

Such a unit has a number of advantages:

1. Factory wiring and test of the complete control.
2. Elimination of separately mounted boxes with their individual connections, conduit runs and clearance space requirements.
3. The grouping together of pieces of similar polarity.
4. Increased accessibility for inspection and maintenance.
5. A considerable weight advantage to the single unit construction.

Performance-wise the new cars have a marked advantage over previous subway equipment. The current build-up during the initial portion of the acceleration or braking cycle is cushioned in such a way that the car attains its ultimate steady rate on a smooth, sweeping curve. The advantages of such a build-up characteristic are obvious for both the riding public and the operator. It provides for the passenger, particularly the standee, an easier, more comfortable ride; and for the operator, reduced maintenance due to lower impact stresses at starting and when brakes are applied.

Car Ventilation

An innovation in the new car design is introduced in the use of six Railvane fans for more efficient ventilation. This system employs variable speed of the fans under thermostat control, combined with careful design of plenum chambers and fresh air intakes for proper mixture and proportions of outside air and recirculated air. With this ventilating system, the air movement is well distributed throughout the car and the volume of air circulation is automatically increased when the temperature within the car tends to rise. This represents an important advance in passenger comfort under all-weather conditions, since the fans will be used for air circulation in winter as well as summer.

Interchangeability of Parts

With the introduction of new car equipments, there is inevitably the question of how many new parts are involved and how great an increase is required in storeroom space and inventory. The storekeeping problem is a matter of real importance to the operating company, but happily this does not present a major problem for these 300 new cars, because the electrical equipment duplicates the apparatus so successfully used on the previous orders. The design changes made are centered chiefly on the regrouping of apparatus and providing better accessibility, which does not affect the component parts. Wherever the design of detail parts is changed, the new parts can, in general, be used on the older cars so that the number of additional parts to be stocked is held to a minimum.

As these new cars take their place in the busy rapid transit service of New York City, they introduce advances in car design and electrical equipment which once again raises the standard for heavy duty metropolitan subway cars.

To the operator, the tangible advantages are improved equipment layout, apparatus designed for rugged duty, automatic operation with simple straightforward control circuits, lower maintenance and the ability to operate for longer periods between inspections.

For the riding public the new cars provide more rapid loading, and easy start and smooth braking build-up, and a fully engineered car ventilation system for year-round use.

For the metropolitan area, the new cars represent another step in the long range program for improving rapid transit facilities.

ADAPTABLE TO ALL DROP BOTTOM GONDOLAS

Wine Drop Bottom Locks and Spring Hinges have long been established as the practical method for drop bottom closure. Basic simplicity and ruggedness of the mechanism requires little or no servicing, and the accessible method of adjustment on the individual lock assures positive door fit.

Featuring single door operation, any or all doors open as required to control lading distribution. Maintenance-wise, a single door and mechanism may be dismantled without disturbing adjacent doors. The Wine Drop Bottom Combination offers all the important improvements—individual door fit, minimum maintenace, and easy, one man selective operation.

THE WINE RAILWAY APPLIANCE CO., TOLEDO 9, OHIO

Questions and Answers

Car Heating Systems

This group of Questions and Answers has been prepared by the Vapor Heating Corporation and pertains primarily to problems associated with Vapor equipment. This is not part of a series but additional material of this type will be published when available—Editor

Q—What is the recommended location of the one thermostat in a coach equipped with a Vapor Unizone heating system?
A—The heat thermostat of the Unizone heating system should be about 68 inches above the floor and about two inches from the aisle edge of the cross partition in the car at the same end of the car where the circulating fans are located.

Q—Why is this the recommended location for the thermostat?
A—Because it is important that the air around the thermostat is an accurate sample of the temperature in the seating area of the car.

Q—Is air distribution an important factor in keeping an even, comfortable temperature in the car?
A—Yes, proper air distributed is very important because the air nearest the overhead radiator is warmer than the air at the far end of the overhead air duct. Therefore, more warm air must be released at the far end of the duct in order to distribute the heat evenly in the car. For example, if overhead air distribution is such that a large percentage of heated air is released at the first two or three duct outlets the thermostat will be adversely influenced and a definite temperature differential will be reflected in the whole car. It is generally true that when the air is properly distributed for cooling it is also properly balanced for heating.

Q—Is a small degree of pressurization desirable in passenger cars?
A—Yes, because it helps to eliminate drafts caused by doors being opened, as well as keeping warm air pressed against unavoidable leaks. Pressurization also keeps dirt from filtering into the car.

Q—With a Unizone heating system how is the heat release balanced between overheat and floor radiation?
A—By the proper setting of the adjustable orifices in the two Vapor balancing manifolds for floor heat, and the Vapor balancing orifice in the supply line to the overhead radiation. This is necessary to distribute the steam in the right proportion to keep the whole car at an even temperature. Once adjusted the orifices are locked in position and should not be changed.

Q—What is the recommended location on the car for the one Vapor steam regulator?
A—Between the overhead riser and the center of the car, preferably not more than 15 ft from car center.

Q—How often is it recommended that a Vapor Steam Regulator No. F968 be overhauled or changed out?
A—Once every 18 to 24 months each regulator should be changed out and replaced by a regulator that has been repaired and tested at a central repair point.

Q—How does one test the electrical circuit operating the Unizone Heating System?
A—By pushing the test button on the control panel when the thermostat is calling for heat. By doing this the maintenance man can observe the action of the relay and check the opening and closing action of the safe control valve on the steam regulator.

Q—How is wash water heated on a car equipped with Unizone Heating System?
A—A spring loaded check valve is built into the Vapor Unizone Steam Regulator that supplies a continuous flow of steam to the hot wash water heater exchanger, regardless of whether or not steam is being used to heat the car.

Q—Is Vapor Unit-Fin floor radiation made for and used in railroad cars different from regular fin radiation used to heat buildings?
A—Yes, Unit-Fin radiation is made with the steam feed pipe inside the pipe with the fins. Steam enters the inner pipe and goes to the far end of the section of radiation, then into the outer pipe, this done to release heat evenly along the full length of radiation and eliminate the need of a return line.

Q—Is the steam positively off when the cooling system is operating?
A—Yes, the safe control valve in the Vapor Steam Regulator opens and by-passes steam back to the regulator. The outlet check valve provides a positive shut off to keep steam vapors from entering heating radiation during the cooling period.

Q—In case of electrical failure can the car still be heated?
A—Yes, the steam is automatically fed to the heating system when current is not available, the amount of heat may be manually controlled by a valve in the car.

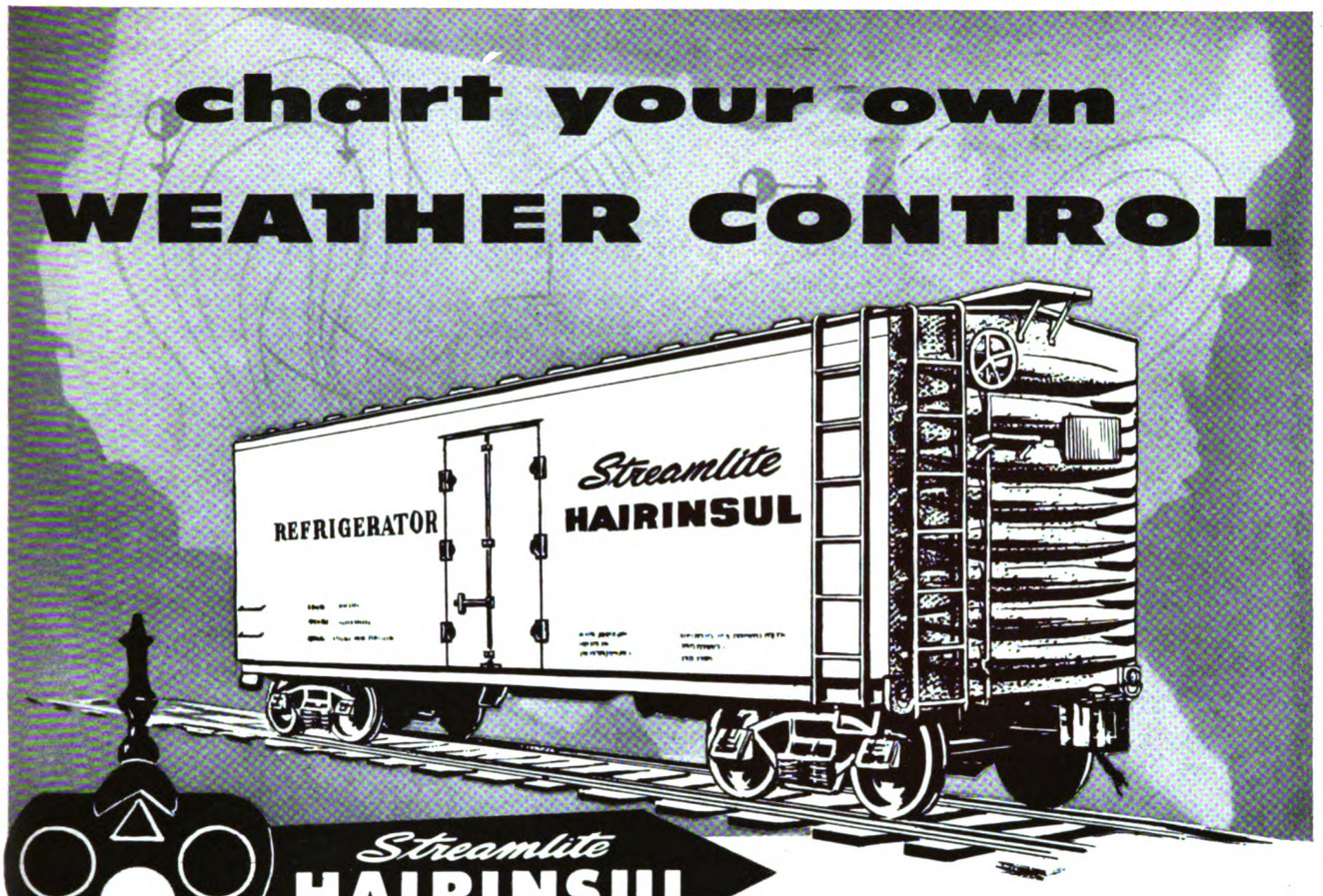
Q—Is it necessary to have a reducing valve in addition to the Vapor Steam Regulator?
A—No, because a reducing valve is built into the Vapor Steam Regulator that reduces the train line steam pressure which may be up to 250 pounds pressure, down to 50 pounds pressure, then the safe control portion of the steam regulator reduces the steam pressure down 12 pounds pressure which is the maximum pressure that steam is allowed into the radiator when the thermostat calls for heat.

Q—From the above question does this mean that the Vapor Unizone Heating System is a 12 pound pressure steam heating system?
A—No, the system works on ounces of pressure in mild weather up to 12 pounds pressure in very cold weather. When the thermostat calls for heat the regulator feeds steam through the radiator and back to a thermo-sensitive bellows in the regulator which operates in such a way as to control the amount of steam fed to the radiator.

Q—Why is it desirable to have all radiation condensate return to the Vapor Steam Regulator?
A—In order to eliminate steam traps, and it is better to release heat condensate from one central point.

Q—What size pipe is recommended for the heating system?
A—All under car piping between the Vapor Steam Regulator and the radiation should be 1 in. IPS or 1⅛ OD copper tubing.

chart your own WEATHER CONTROL



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- **LOW CONDUCTIVITY.** Thoroughly washed and sterilized, all-hair heat barrier. Rated conductivity – .25 btu per square foot, per hour, per degree F., per inch thick.
- **LIGHT WEIGHT.** Advanced processing methods reduce weight of STREAMLITE HAIRINSUL by 40%.
- **PERMANENT.** Does not disintegrate when wet, resists absorption. Will not shake down, is fire-resistant and odorless.
- **EASY TO INSTALL.** Blankets may be applied to car wall in one piece, from sill to plate and from one side door to the other. Self-supporting in wall sections between fasteners.
- **COMPLETE RANGE.** STREAMLITE HAIRINSUL is available ½" to 4" thick, up to 127" wide. Stitched on 5" or 10" centers between two layers of reinforced asphalt laminated paper. Other weights and facings are available.
- **HIGH SALVAGE VALUE.** The all-hair content does not deteriorate with age; therefore has high salvage value. No other type of insulation offers a comparable saving.

Shipments of valuable perishables are at the mercy of extreme temperature changes unless properly protected. Only an efficient refrigerator car insulation can reduce this hazard.

Leading refrigerator car builders recognize this. That is why, for the better part of a century, they have been specifying all-hair insulation. They know that STREAMLITE HAIRINSUL is the one insulation that is fully efficient under all weather conditions – hot or cold – no matter how severe.

Other reasons why car builders specify STREAMLITE HAIRINSUL are listed at the left. These are just a few –there are more. Write for complete data.

MERCHANDISE MART, CHICAGO 54

SETS THE STANDARD BY WHICH ALL OTHER REFRIGERATOR CAR INSULATIONS ARE JUDGED

Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

(Manual 2310, page 401)

G197-Q—Describe the steps to be taken when filling the system.
A—(1) Stop engine; (2) open filling level valve G; (3) fill slowly until water runs out filling level pipe at valve G2; (4) close filling level valve G.

G198-Q—What additional step should be taken if filling a dry or nearly dry engine?
A—Start the engine and run for several minutes.

G199-Q—Why is this done?
A—This will eliminate any air pockets in the system.

G200-Q—What further steps should be taken?
A—(1) Shut down engine, open valve G and wait three minutes; (2) add water until it runs out filling level pipe; (3) close filling level valve G.

(Manual 2310, page 403)

G201-Q—What precaution must be taken in case a hot engine cooling system has been drained?
A—Do not fill immediately with cold water.

G202-Q—Why is this precaution necessary?
A—The sudden change in temperature might crack or warp the cylinder liners and heads.

G203-Q—What additional precaution must be taken when filling the cooling system?
A—(1) Do not attempt to fill the cooling system through the drain pipe located underneath the locomotive; (2) the system should not be filled above the maximum water level indicated on the water tank.

G204-Q—Why is this precaution necessary?
A—(1) To prevent freezing of radiators in winter; (2) to prevent loss of rust inhibitor when draining back to G valve level.

Lubricating Oil System

G205-Q—How is the engine lubricated?
A—Oil under pressure is forced through the engine for lubrication and piston cooling by the combination piston cooling and lube oil pump.

G206-Q—What becomes of lube oil which falls into the oil pan?
A—Lube oil which falls into the oil pan is picked up by the scavenging oil pump and forced through the oil filters and cooler to the oil strainer housing, where it is ready for recirculation by the oil pump.

G207-Q—What becomes of the excess oil?
A—It returns to the oil pan where it is held until used.

Oil Level

G208-Q—When may the oil level be checked?
A—The oil level may be checked with the engine running at any speed.

G209-Q—How should the oil level read?
A—Between LOW and FULL on either bayonet gauge (one on each side of engine).

G210-Q—What happens when the engine is stopped?
A—When the engine is stopped, the oil from the filter and cooler will drain back into the oil pan.

G211-Q—In this case what should be the indication on the dip stick?
A—The indication on the dip stick should show SYSTEM CHARGED.

G212-Q—What is the marking SYSTEM UNCHARGED used for?
A—It is used by maintenance forces at the time new oil filter elements are installed.

Adding Oil to the System

G213-Q—When adding oil to the system, which opening is used?
A—The oil must be poured through the opening having the square cap on top of the strainer housing.

G214-Q—Why should the round caps never be used (removed for filling) while the engine is running?
A—Hot oil under pressure will come from the openings and possibly cause personal injury.

G215-Q—Why is the level SYSTEM CHARGED, below the SYSTEM UNCHARGED level?
A—Because some oil is trapped in the lube oil filter, oil lines and engine.

Oil Pressure

G216-Q—What normally is the oil pressure at 800 rpm?
A—Normally 35 to 45 pounds.

G217-Q—What should be the minimum?
A—It should not drop below 20 pounds.

G218-Q—What should the oil pressure be at idling speed?
A—At idling, the pressure should be at least 6 pounds.

G219-Q—What takes place in the event of dangerously low oil pressure?
A—The engines will automatically be stopped.

Fuel Oil Systems

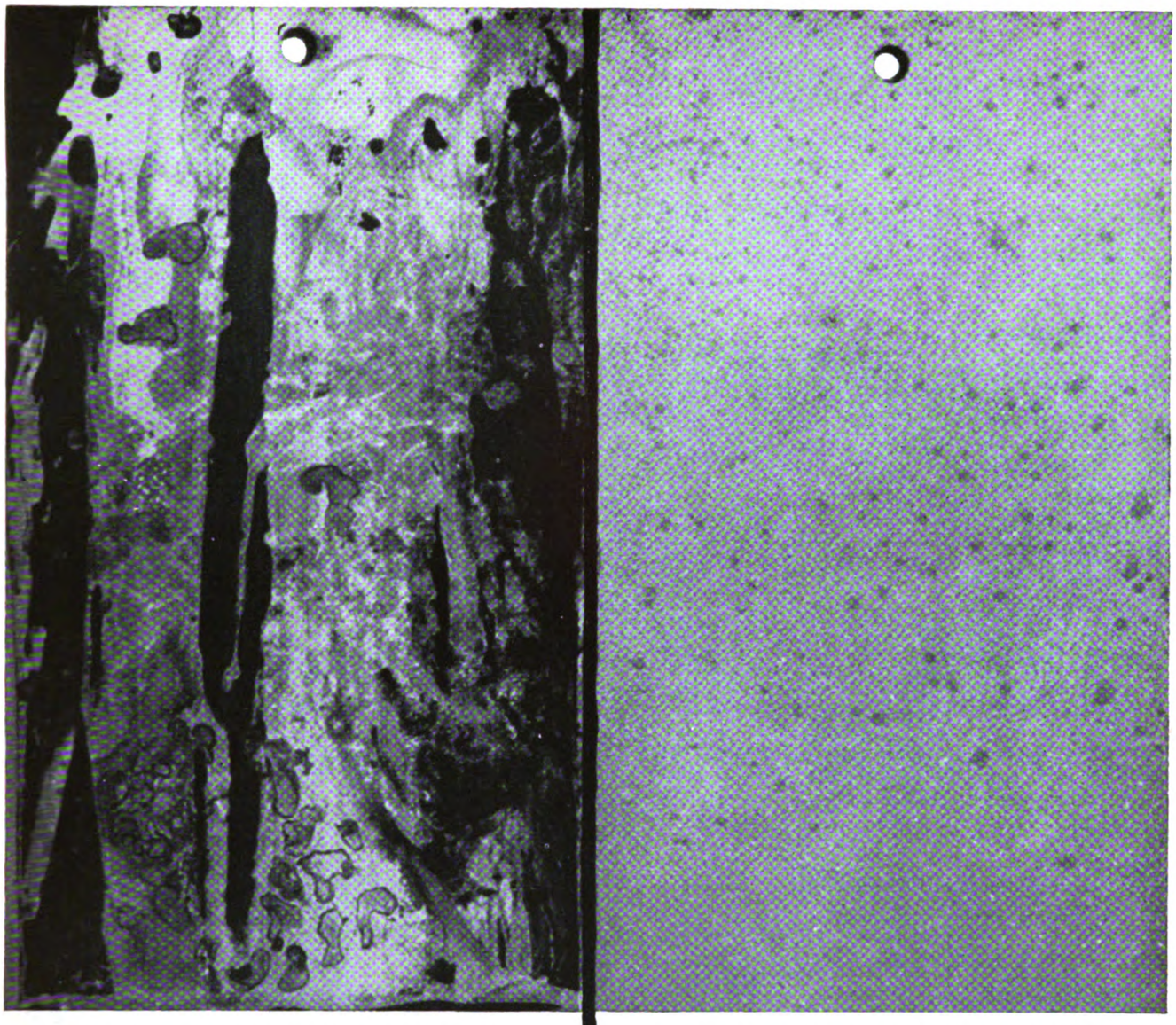
(Manual 2310, page 405)

G220-Q—How is fuel in each unit circulated?
A—Fuel in each unit is circulated through the injectors by an electric driven fuel pump.

G221-Q—What, in the fuel system, can cause fuel failure?
A—Failure of pump to operate, closed emergency fuel cut off valve or clogged strainer.

Fuel Flow

G222-Q—What would be the indication of proper engine operation?



2 MINUTES AFTER FLOWING ON PENNSALT CLEANER 23, the paint has blistered and is beginning to sag away from the base metal.

3 MINUTES AFTER FLOWING ON PENNSALT CLEANER 23, only the bare metal is left. The 4-coat standard freight car paint film has been completely removed.

This powerful alkaline cleaner strips paint to bare metal in 3 minutes

PENNSALT CLEANER 23

Pennsalt Cleaner 23 is an extremely active alkaline cleaner with a strong affinity for painted surfaces. It strips the thickest paint film to bare metal in minutes without the usual streaks and residue.

Pennsalt 23 is a *free-rinsing* stripper. This property not only helps the loosened paint run off in sheets, but also simplifies the problem of getting the metal surface ready for re-painting.

If you want to speed your own paint removal processes, use Pennsalt Cleaner 23. It will remove up to 25 coats at one application. If you have a combination of paint, caked grease and road grime to get off, this cleaner will remove all three at the same time. Whether you use soak tank or spray methods, you save both stripping and rinsing time with Pennsalt 23.

For more information, see your Pennsalt Railway Maintenance Specialist. Or write: Pennsylvania Salt Mfg. Co., Railroad Maintenance Dept. EAST: 1083 Widener Bldg., Philadelphia 7, Pa. WEST: Woolsey Bldg., 2168 Shattuck Avenue, Berkeley 4, Calif.

Favorite of the men in the shops

Pennsalt Chemicals

Chemical Progress Week May 16-21

A—A good flow of fuel (clear and free of bubbles) should be indicated in the fuel return sight glass.

G223-Q—Where is the fuel return sight glass located?
A—On the duplex filter assembly, nearest the engine.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F192-Q—Suppose that the engine load tends to fall below the rated figure for any engine speed?
A—In this case the load control pilot valve will cause the load regulator to decrease the resistance or move toward maximum field.

F193-Q—Does this constitute a torque control?
A—No. The centered position of the pilot valve is dependent on speed setting and not on the actual engine speed.

Indicator Scales on the Governor

F194-Q—Describe this feature.
A—On the outside of the governor are two pointers with scales. One is marked SPEED and markings correspond to throttle position. The other is marked FUEL and indicates power piston position in sixteenths of an inch.

F195-Q—How is the fuel scale reading calculated?
A—The lower the fuel scale reading, the more fuel is being injected into the engine.

Over-riding Solenoid in Governor

F196-Q—How is the over-riding solenoid energized?
A—By either wheel slip relay.

F197-Q—What is its function?
A—It operates to send the load regulator to minimum field by control of oil flow.

Governor and Load Regulator Indications for Correct Loading

F198-Q—How can a quick check be made for correct engine loading at full throttle?
A—By observing the load regulator and the pointers on the governor.

F199-Q—Why should this check be made at full throttle?
A—Variations at part throttle may cause confusion.

F200-Q—Where should the governor speed pointer be with throttle in run 8 position?
A—At 8 to coincide with the throttle.

F201-Q—Where should the governor fuel pointer be?
A—Governor fuel pointer should be at 6.

F202-Q—What would a higher reading indicate?
A—Insufficient fuel to the engine.

F203-Q—What would a lower reading indicate?
A—Indicates excessive fuel to the engine or that fuel pressure to engine is low.

F204-Q—Where should the load regulators in each unit be?
A—Load regulators in each unit should be between 9 and 5 o'clock.

F205-Q—What is the trouble if the arm stays at 7 o'clock?
A—Unit is at minimum field, indicating governor trouble, or that engine is starving for fuel.

F-206-Q—What is wrong if the arm stays at 5 o'clock?
A—Unit is at maximum field, indicating governor or electrical trouble.

F207-Q—What procedure should be followed in case the observed readings indicate governor trouble?
A—A report should be made for correction. Do not attempt any adjustments on road.

Schedule 24 RL Air Brakes

1837-Q—What is the result of this bucking action?
A—This bucking action results in loss of flux required to hold the relay in its energized position, and it therefore drops out.

1838-Q—Describe this action further.
A—Relay T by this means can recognize that the brakes are applied and so disconnects the battery supply from the head end of the two Wheatstone bridges by its contact B3-B4, and opens the connections from the bridges to the application and release wires by its contacts C1-C2 and C3-C4.

1839-Q—In the application of the circuit checking equipment to the train line circuits what must be checked?
A—The wiring to the master controller as well as the wiring to the magnet valves in the train.

1840-Q—Where is this shown?
A—This is shown in Plate 17.

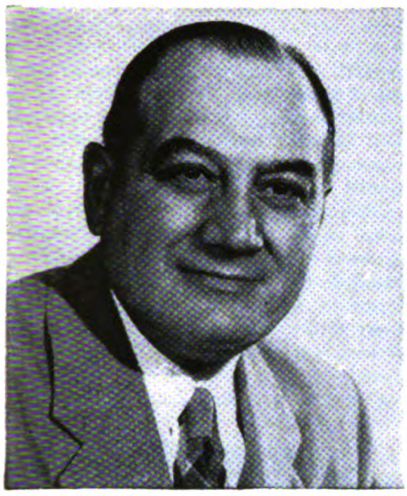
1841-Q—What is the first thing to be done?
A—First, it is necessary to check that the battery supply to the master controller is intact.

1842-Q—How is this done?
A—This is done by arranging the circuits so that it is impossible to get B to the circuit checking equipment unless it has first gone to the master controller.

1843-Q—Describe the arrangement as shown in Plate 17.
A—The top line in Plate 17 is the B+ supply, and it will be found that this wire is first connected to terminal 4 of the master controller, then to terminal 3. and then to terminal of circuit checking equipment.

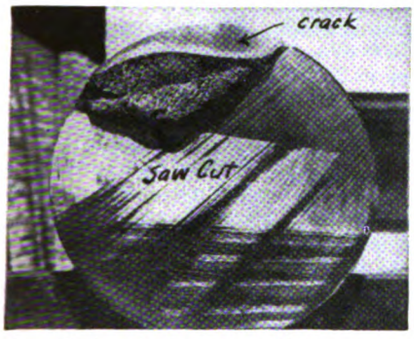
NEW YORK CENTRAL SYSTEM

Insures against costly diesel axle failure with REGULAR ULTRASONIC INSPECTION



"Safety is a responsibility to the public as well as sound management practice," states Mr. W. F. Kascal, Chief Mechanical Officer, New York Central System. "To keep pace in today's highly competitive transportation industry no railroad can afford to operate without modern inspection tools."

The New York Central, through cooperative research with Sperry, was instrumental in developing practical ultrasonic diesel axle inspection.



Crack in dust guard fillet area, revealed in place by Reflectoscope, could have caused a wreck had it progressed to failure. The Central has three Sperry Ultrasonic Reflectoscopes at work in their Syracuse, Collinwood and Beech Grove Shops. There, rapid, thorough, in-place testing of all critical areas of diesel axles is performed regularly on an integrated maintenance schedule.

Under-the-engine testing gives fast, positive and economical insurance against sudden axle fatigue failure. Testing from the axle end, three angle-beam search units are used to probe the three critical areas. The 24° search unit scans the dust guard area; the 19° search unit tests the wheel seat area; and the 15.5° search unit inspects the gear seat area. Each unit is moved around the outer periphery of the axle end. This accurately beams the sound to the area under test. As ample proof of the value of ultrasonic inspection, the Central found five defective diesel axles among the first 1737 tested.

Reflectoscope inspection assures sound diesel axles for the 20th Century Limited, shown here speeding down the Hudson toward New York City. The Reflectoscope is also invaluable for testing freight car axles and wheels as well as diesel axles and engine parts.

Sperry

FIRST IN RAIL TESTING

SPERRY RAIL SERVICE

Division of Sperry Products, Inc.
Danbury, Conn.
New York Chicago St. Louis

Continuous research in ultrasonic testing has developed techniques for inspecting numerous vital railroad components. For example, Sperry has the answer to fast, economic car axle and wheel testing problems. Contact the Sperry office nearest you for detailed information on these and other tests. We'll be glad to give you working demonstrations in your shops.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets, and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. DIESEL ENGINES. *Ingersoll-Rand.* 20-page colorful bulletin (10,040) describes the features of the Type S and SS heavy duty diesel engines in sizes from 375 to 1000 hp.; gives complete data on lubrication, cooling and fuel injection systems.

2. NICKEL-COPPER STEELS. *International Nickel Co.* 48-page booklet (3004) "Nickel-Copper High Strength Low Alloy Steels" illustrates the wide application of these steels; gives working methods, mechanical properties, compositions and availability of seven steels of this class.

3. D-C MOTOR. *Reliance Electric & Engineering Co.* 12-page illustrated bulletin (C-2002) "The New Reliance Super T Line D-c. Motor with Dynamic Response" includes data on speed ranges, acceleration rates, enclosures, dimensions and selection.

4. POWER QUILL. *Precise Products Corp.* 20-page General Catalog FGH-2 and 4-page price list describe, illustrate and give specifications on the all new Precise Super 60 Power Quill and Grinder-Millers.

5. ELECTRICAL TAPES. *Permacel Tape Corp.* 4-page brochure "Permacel 2 in 1 Electrical Tapes" discusses the application of one tape doing the work of two; discusses how these tapes are both heat curing and self-sticking, how they stick at a touch, and that baking or high operating temperatures strengthen rather than soften the adhesive.

6. BEARING EXTRACTOR. *Engineering Imports.* 4-page brochure "Tracta . . . A New Type Ball and Roller Bearing Extractor" diagrams and explains this extractor which "is gripped on the inner race" reducing bearing or shaft damage.

7. LUBRICANTS. *The Alpha Corp.* Field Report #140 gives a "how-to" discussion on the lubrication of engines and compressors with "Molykote Type G" molybdenum disulfide.

8. PROTECTIVE COATING. *Pennsylvania Salt Mfg. Co.* Complete product information offered on Thick-Coat (new resin coating), including specifications, estimating data and directions.

9. JIB CRANES. *Abell-Howe Co.* 8-page brochure "Jib Crane For Economical Free-Swinging" pictures eight of the more popular types of jib cranes and describes the usual application of each; includes available accessory equipment.

10. ALUMINUM-SHEATHED CABLE. *Okonite Co.* 12-page 2-color bulletin (1088) "Okotherm Aluminum-Sheathed Cable" describes, illustrates with on-the-job photos, and with tables gives dimensions and fittings of this new cable construction for hot (up to 200° C. or 392° F.) locations.

11. ELECTRIC PLANTS. *Multi-Matic Corp.* 4-page catalog (G-3155) illustrates complete line of 23 Gen-A-Matic electric plants (both AC and DC), illustrates some of the line, shows typical uses, gives in chart form specifications and a table of power requirements.

12. CRANE SCALES. *Baldwin-Lima-Hamilton Corp.* 12-page illustrated bulletin (4304) describes, illustrates and gives typical uses of Baldwin SR-4 crane scales; includes seven standard sizes, special larger size scales, instrumentation, accessories and applications.

13. LATHES. *South Bend Lathe Works.* 128-page 53rd edition of "How to Run a Lathe," with over 365 illustrations, in eleven chapters, covers items such as correct installation and leveling of lathes, standard tolerances, and tooling dimensions; in non-technical language, available in paper binding for *50¢ per copy.*

14. GEARING. *Foote Bros. Gear & Machine Corp.* 42-page plastic-bound Engineering Manual (DR.2) on the complete line of Foote Bros. Duti-Rated Lifetime Gearing; illustrates and gives specifications, and special section gives gear maintenance tips.

15. PRESS BRAKES & BRAKE DIES. *Service Machine Co., Inc.* 8-page 2-color folder illustrates and gives specifications on SEMCO steel press brakes and forged steel press brake dies.

16. STUD WELDING. *K S M Products, Inc.* 16-page booklet "Standardized Stud Welding Design and Specification" describes, illustrates and gives ordering, application and engineering data on 12 most commonly used studs, and on pins and pads.

17. ENGINES. *Le Roi Div. Westinghouse Air Brake Co.* 8-page 3-color catalog-bulletin (E-9) describes and illustrates the 115 to 410 horsepower Le Roi L3000, H2000, and F1500 engines, uses cutaway views and photos to show features; basic specifications and map showing location of factory branches and distributors included.

Reader Service Department **MAY, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17

Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

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EQUIPMENT

(Continued from page 26)

possible the higher speeds and helps to stabilize operation of the electrode. The contact technique can be used. Spatter is low, and slag removal is much easier than conventional operation with other electrodes.

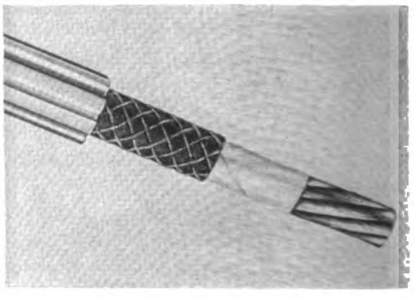
The product is usable on alloy and mild steels, and meets the requirements of the E-6016 classification in "as-welded" condition, and E-7016 class in the "stress relieved" condition. *Welding Department, General Electric Company, 1 River Road, Schenectady 5, N. Y.*

Dielectric Tester

The Model 424 D.C. Hypot is a versatile instrument for dielectric testing up to 5000 volts dc, and insulation measurement up to 50,000 megohms. This unit has been redesigned for increased serviceability and ease of panel mounting.

The device features a continuously variable output of 0-5/10/50/100 microamperes indicated on a microammeter which is electronically protected against overload. Alternating current ripple at rated voltage and current is less than 1 per cent.

It is housed in a grey wrinkle finish steel case which is 22 in. by 14-¾ in. by 12-5/16 in. with 5 ft output leads terminating in a clip and retractable tip prod. The unit is arranged for standard rack and panel mounting. *Associated Research, Inc., 3758 West Belmont Avenue, Chicago 18, Ill.*



Fluted Welding Cable

Called U.S. Royal Gold Welding Cable, the product is light and flexible. Its manufacturer claims that it is long wearing

on all types of welding equipment and has greater impact resistance than special cable constructions. The fluted jacket gives better grip and is cooler to handle, since its greater surface area dissipates heat faster than conventional round cable.

Finished with a yellow jacket, it is easier to see, reducing accidental damage. This also provides identification from a black cable in cases where two cables are required on welding units.

This jacket is made of 60 per cent natural rubber compound with high impact, abrasion and moisture resistance. A reinforcing braid of rayon provides a non-slip bond between the jacket and the insulation. The conductors are wrapped with a high grade insulating paper tape. *United States Rubber Company, Rockefeller Center, New York 20, N. Y.*

Pressure Gage

A time-saving method of production checking the hydraulic tailstock pressure of lathes with this pressure gage has been reported by a manufacturer of automatic lathes. All that is necessary is to place the gauge between the blocks which, in turn, are held between the gauge and tailstock of the Camlock spindle nose. Full tailstock pressure is then exerted against the gage by turning a tiny crank on the side of the tailstock, and a reading in pounds is instantly given on the gage dial.

The instruments are available in ranges for 0 to 10 lb up to as high as 0 to 10,000 lb in 10 sizes. All capacities have an accuracy of 1 per cent plus or minus and will withstand accidental overloads up to 25 per cent. The 10,000-lb model measures only 4-9/16 by 5-7/8 by 2-9/16 in and the lighter models are still smaller. *W. C. Dillon & Co., 14620 Keswick street, Van Nuys, Cal.*

Aluminum-Coated Steel

Armco Aluminized Steel Type 2 is said to combine the corrosion-resisting and heat-reflecting qualities of aluminum with the strength of steel. Several thousand tons of the product have been used in development work in prefabricated industrial, commercial and farm buildings, industrial rolling doors, water storage tanks, roof decks, and other applications under general atmospheric conditions.

The steel is reported to have the same

The only ½ to 5 KW Positive Gear Railway Generator Drive on the market

...now makes possible New efficiencies, New economies, New conveniences for ALL railroads

TWO-WAY RADIO

LIGHTING EQUIPMENT

REFRIGERATION

The new, small ½ to 5 KW Spicer ***Positive Gear*** Generator Drive makes available to caboose, baggage, refrigerator, and mail cars, all the advantages of steady, ample electrical current.

And the new Spicer Drive delivers the power for this ½ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer ***Positive Gear*** Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lighting, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.

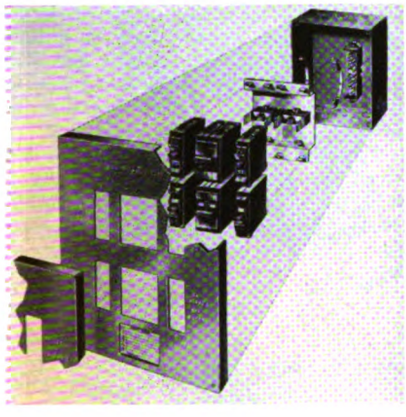
Manufactured and Sold by:

Spicer **DANA CORPORATION**
TOLEDO 1, OHIO

high reflectivity of radiant heat as aluminum whether from the sun or from low temperature heat sources as are used to heat buildings in winter. Resistance to fire damage is said to be much better than that of aluminum or galvanized steel. The coating withstands temperatures up to 900 deg F with no change whatever, and temperatures up to 1250 deg F without serious damage to the coating.

Coefficient of expansion is said to be only half that of aluminum. This means less trouble from buckling or tearing at nail, rivet or bolt holes when sections or panels undergo heating and cooling cycles. It can be embossed and spun, but it is not recommended for drawing operations. Welding is easily done by all conventional methods and a satisfactory method of soldering is still under development.

Cost per sq ft is claimed to be generally lower than aluminum of equal thickness. Cost savings are pronounced because the greater strength of the steel base permits use of lighter gauges. The product does not require painting to extend service life *Armco Steel Corporation, Middletown, Ohio.*



Circuit Breaker Load Centers

These load centers are for use as service entrance equipment. A snap-action spring clip that allows load center interiors to be installed and removed without screws, tools or any adjustments is an important feature of the device.

Available in 8, 12, 16 or 20 circuits, they are equipped with 100 amp main lugs. The 16-circuit load center is a split-bus design in which one two-pole circuit breaker feeds up to eight other breakers on the sub-distribution portion of the bus. Fronts with doors are available for the 12, 16 and 20 circuit load centers.

All current-carrying parts are silver-plated copper which gives high conductivity and cool operation for greater safety. Boxes are finished with a Bonderite coating which seals the paint to the metal and protects against rust. Both general purpose and raintight enclosures are available for the load centers and fronts for either surface or flush mounting can be specified. *General Electric Company, Trumbull Components Department, Section TC-1, Plainville, Conn.*

GARLOCK REPLACEMENT PARTS

Gaskets—Packings—Molded Rubber Rings for diesel locomotives . . .

Section of Garlock's diesel parts stock room

NOW pre-stocked in handy packages, ready for immediate shipment

Packaging and labeling diesel parts after inspection.

GARLOCK diesel replacement parts —gaskets, packings and molded rubber rings—are packaged in convenient quantities for ease in handling, storing and redistribution to shop men, overhaul shops and terminal points.

All packages are labeled for instant identification—no cross-reference parts list needed.

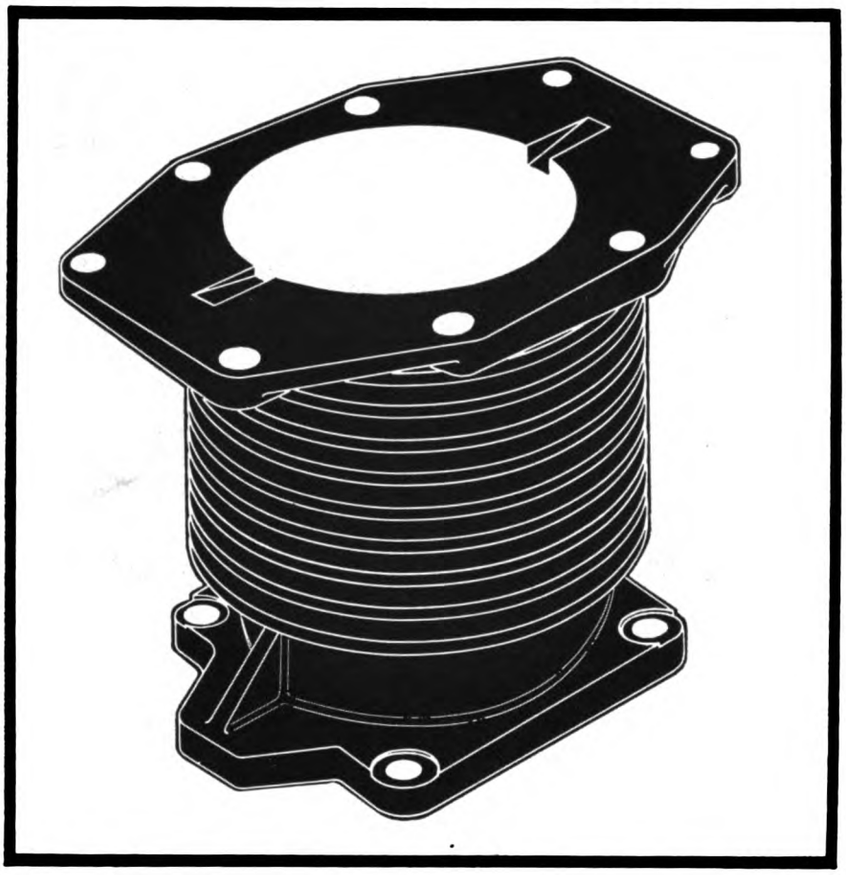
Garlock diesel gaskets, packings and molded rubber rings are giving completely satisfactory service on leading railroads. Specify Garlock diesel replacement parts and write us for complete parts-and-price list.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.
Branch Offices in Most Principal Cities

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

A/C Cylinders too!



Another road tested application for wear resistant PORUS-KROME*

● **Write today for detailed information on this *NEW* reclamation service.**

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Dept. RL-1, VAN DER HORST CORP., OLEAN, N. Y.

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Good for the Life of your Engines

VAN DER HORST
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TERRELL, TEXAS
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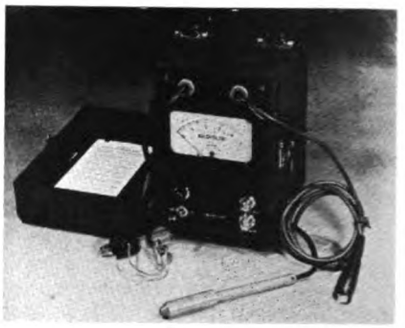
HILVERSUM, HOLLAND

*U. S. Patents
2,048,578, 2,314,604, 2,412,698

** SparTan Engineering
West Coast Licensee



Insulation Test Set

The Model 405A Hypot Junior insulation test set, with a rating of 0-5000 volt a-c, is said to complete the line of these sets with ratings from 1,500 to 10,000 volt. The unit was primarily designed for accurate, non-destructive testing of appliances and small electrical components by unskilled operators, and meets Underwriters Specifications for most of this equipment.

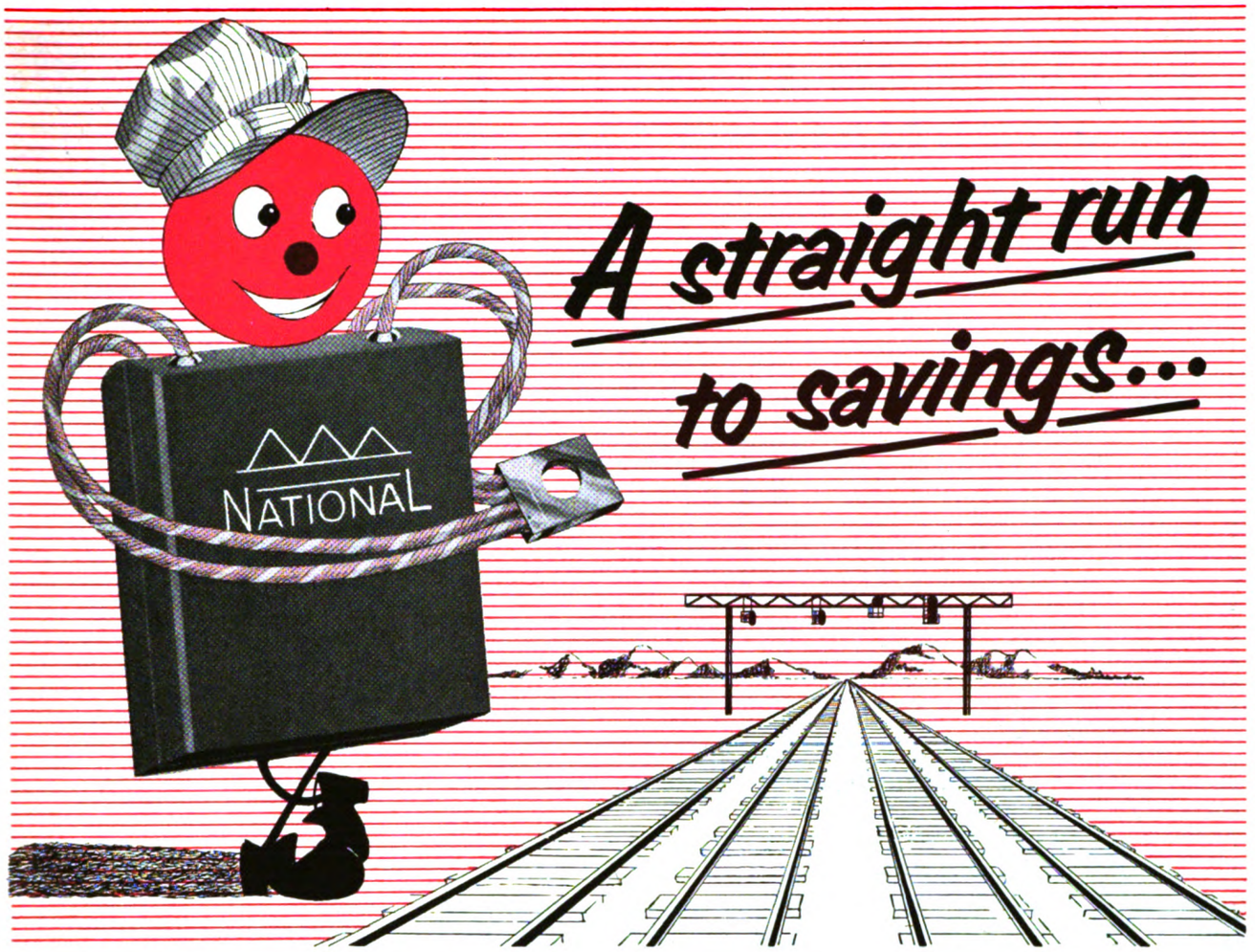
The tester features continuously variable output voltage, current limiting high reactance transformer, a neon breakdown lamp to indicate arcing or corona in test circuit, a neon leakage lamp to indicate excessive current flow, grounds and short circuits, and a kilovoltmeter connected directly across the output. Input to the device is 115 volt a-c, 60 cycle.

The instrument is housed in a welded steel case measuring 6 in. by 9 in. by 8-½ in. with a plastic carrying handle. Net weight is 15 lb. *Associated Research, Inc., 3578 West Belmont ave., Chicago 18.*

Frequency Meter

For checking alternating current in the 400 cycle per second range, this meter operates on the principle of a series of progressively tuned reeds, with a-c frequency indicated by vibration of the corresponding reed or reeds falling within a sharply peaked resonance response curve.

Insulated test probes are provided for shunting a portion of voltage in the tested line across the 10,000 ohm internal resistance of the meter. An electromagnetic coil-armature combination supplies mechanical energy at the a-c frequency



THE NATIONAL BRUSH LINE

TRADE-MARK

FOR TRACTION MOTORS, GENERATORS AND AUXILIARIES

When you specify brushes, do you take into account *all* the cost-factors affected by brush performance?

HERE'S HOW TO FIGURE REAL BRUSH COST:

Service Life: brush replacement cost is far more than the cost of the brushes. The down-time involved in more frequent brush installation quickly eats up any first-cost "economy".

Strength: brush breakage and shunt failure mean costly interruptions of service — wear or damage to major equipment.

Commutating ability: frequency of commutator maintenance and overhaul is a direct measurement of brush economy. Arcing, chatter, bar-burning, copper-dragging and threading are often signs of faulty brush performance.

The cheapest brush is the brush that costs least to use. That's one reason why far more "National" brushes are used in diesel-electric locomotive service than all other makes combined.

FREE! National Carbon's BRUSH DIGEST — two-year course in motor and generator maintenance . . . specially edited for operating personnel. Order in bulk for all your men!

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y.

SALES OFFICES: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco

IN CANADA: Union Carbide Canada Limited, Toronto

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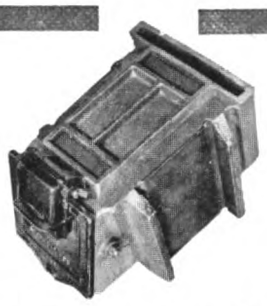

You are assured complete quality control, from raw material to finished journal box, when you choose Franklin Balmar. Both surface-bearing and roller bearing boxes are made of electric furnace steel, cast in our own foundry—and machined to close tolerances on modern equipment by our own highly trained personnel. When you need journal boxes or other steel castings send us your inquiries.

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Woodberry, Baltimore 11, Maryland
***Chicago Office:* 5001 North Wolcott Avenue, Chicago 40, Ill.**

ANNOUNCING... The most revolutionary achievement in ARC WELDING equipment in years!

Dimensions: only 11" x 12" x 7½"

BREN/WELD MODEL 200 AW

Weighs only 65 lbs.— Carry it to the job!
Patent Pending

FIRST TRULY PORTABLE 200 AMP. OUTPUT ARC WELDER

OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING

List Price $169.50 F. O. B. Long Island City, N. Y.

Sensational new transformer development produces far more power to pound! The BREN/WELD does work of conventional welders 4 or 5 times its size and weight... Actually delivers up to 250 amps at reduced duty cycle.

Simple to use, fully guaranteed, it operates on 110/220 volts AC, 50/60 cycles; handles electrodes from 3/64" to 5/32". Has adjustable arc voltage for different arc characteristics. Ideal for plant production and maintenance, for construction work, railroads, on the farm or home.

See your dealer or write direct for details of free trial offer!

24 hour delivery from stock!

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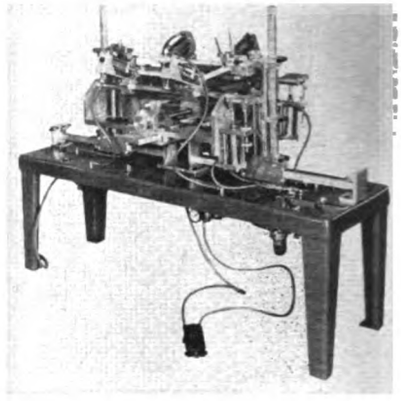
Manufactured by BRENNEN, BUCCI & WEBER, INC. New York City

SALES DIVISION
KASSON DIE & MOTOR CORPORATION
Integrity Since 1919
32-14 NORTHERN BOULEVARD, LONG ISLAND CITY 1, N. Y.

rate to the entire row of reeds. Only the reed having a natural frequency corresponding to the line frequency will undergo vibrational response. These reeds are gold-plated to prevent corrosion.

Instruments and probes are set in a heavy-gage deep-drawn, aluminum case, 6-⅛ by 3-¼ by 3-¼ in., equipped with a carrying ring, snap lock, and a slip hinged, removable cover. *Winslow Company, 9 Liberty street, Newark, N. J.*



Pneumatic Coil Spreader

This device has been designed for smooth, easy and precise coil forming in approximately ⅓ to ½ the time of hand spreading methods. The operator need only insert the loop, step on the foot pedal and remove the finished coil.

Pneumatic operation forms the heaviest, most complex coils to correct spread and exact pitch. They are said to reduce installation time in stators and armatures. Set-up time is short as three adjustments for width of spread and angle take the place of nearly a dozen on old-fashioned spreaders.

The unit is precision built, has few moving parts. Its table top and legs are of ¼ in. steel plate. Manufactured in five standard models of 48 in., 60 in., 90 in., 120 in., and 240 in. capacities by *James Manufacturing Company, Inc., Cincinnati, Ohio* and distributed by *Electric Service Manufacturing Company, Peerless Tool Division, Hanover, Pa.*

Cleaners and Solvents

A recently developed line of degreasing solvents and cleaners has been designated by the manufacturer as Darsol. Developed to replace carbon tetrachloride and other toxic compounds are Darsol solvents 650, 600 and 350. Claimed to be of low toxicity, these solvents are specified for metal cleaning where rapid drying and absence of film is required.

Darsol solvents 74-C, 45-A and 62-B are used to remove grease, oil and traffic dirt on metal parts and equipment. These cleaners are of the emulsifying type and are diluted with kerosene or water in preparing the cleaning solution. *The Dacar Chemical Products Co., McCartney at Wabash Street, West End, Pittsburgh 20, Pa.*

After TWO years of field-testing, here's the

NEW IMPROVED TIREX CORD

- *It's more flexible than ever before!*
- *It has greater pliability when cold!*
- *It's much easier and faster to machine-strip!*

New TIREX CORD retains its Selenium Neoprene Armor for added toughness.

New TIREX CORD is still cured in lead to make it smoother, denser and more uniform.

Simplex TIREX

The New TIREX is the most supple, limber TIREX Cord ever made!

Find out more about the New TIREX CORD. Write to the address below for Folder 1022 today.

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

Lewis sealtite car bolts

More than 85% of America's Class I railroads use Lewis Sealtite products. Designed to do a better job . . . to last longer . . . to meet the most exacting specifications. Specify Hot Dip Galvanized, Zinc finish for Double-Life and economy.

All products are manufactured in the U.S.A. to A.S.T.M. specifications.

Lewis BOLT & NUT COMPANY
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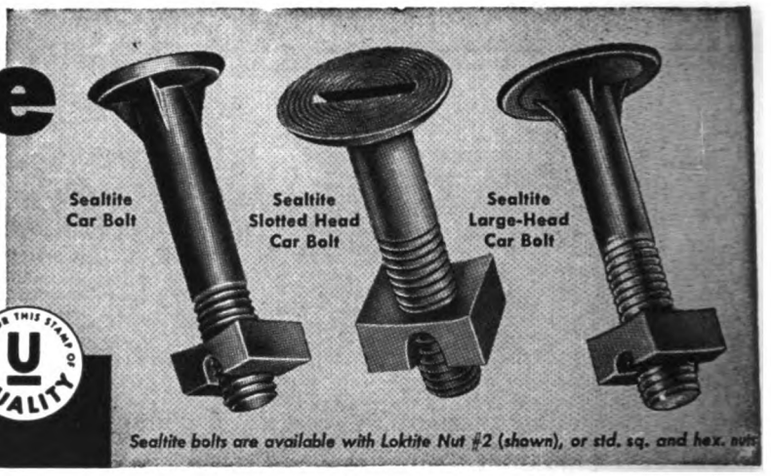
LOOK FOR THIS STAMP OF U QUALITY



Sealtite bolts are available with Loktite Nut #2 (shown), or std. sq. and hex. nuts

P.F.E. Safety Records

(Continued from page 11)

operated throughout the entire year without reportable injury. For instance, all departments at the Colton, Cal., shops were accident free last year which was indeed a "jack pot."

At Los Angeles shops, the stores and ice departments had a clear record for 1954. The same can be said for the car and ice departments at Pocatello, Idaho. In some instances, individual departments have had a clear record for several years. Outstanding in this respect is the stores department at Colton which is now starting its fifth year without reportable accident.

The primary purpose of this safety work by the Pacific Fruit Express has been not only to reduce accidents but build up employee morale and make the various shops and other facilities a place in which men will be proud to work. Looking to the future, special efforts are planned to "hold the line" on reportable accidents and also curtail or eliminate the minor lost-time injuries (3 days or less) which fail to get into official records.

PERSONAL MENTION . . . . . .

Canadian National

ROBERT W. BOWMAN, assistant foreman, Stratford, Ont., motive-power shops, appointed inspector, shop methods, motive power and car equipment department, at Montreal.

W. C. BOWRA, general superintendent of motive power and car equipment, Central region, appointed special assistant in operation department, Central region, with headquarters at Toronto.

K. W. THOMSON, mechanical engineer, at Montreal, appointed general foreman of the Stratford, Ont., motive-power shops.

Canadian Pacific

C. H. PERCIVAL appointed assistant car foreman at Smith Falls, Ont.

Central of Georgia

HUBERT HAWTHORN, mechanical engineer at Savannah, Ga., has retired. Born: New Castle-on-Tyne, England, April 14, 1885. Career: Began in 1904 as a machinist apprentice on Atlantic Coast Line, later becoming machinist and draftsman before entering service of CofG as a mechanical draftsman in October 1909. In June 1924 appointed shop engineer, and in July 1944, mechanical engineer.

Chesapeake & Ohio

M. P. WINSTON, assistant superintendent locomotive department at Grand Rapids, Mich., appointed assistant to assistant superintendent motive power-diesels at Huntington, W. Va. Former position abolished.

Erie

WALTER G. COLEMAN, road foreman of engines, Kent division, appointed road foreman of engines, Mahoning division.

New York Central System

T. G. BOURNE appointed assistant industrial engineer at New York.

E. A. ANESI appointed electrical supervisor at New York.

Norfolk Southern

J. H. WILSON, chief mechanical officer at Norfolk, Va., has retired.

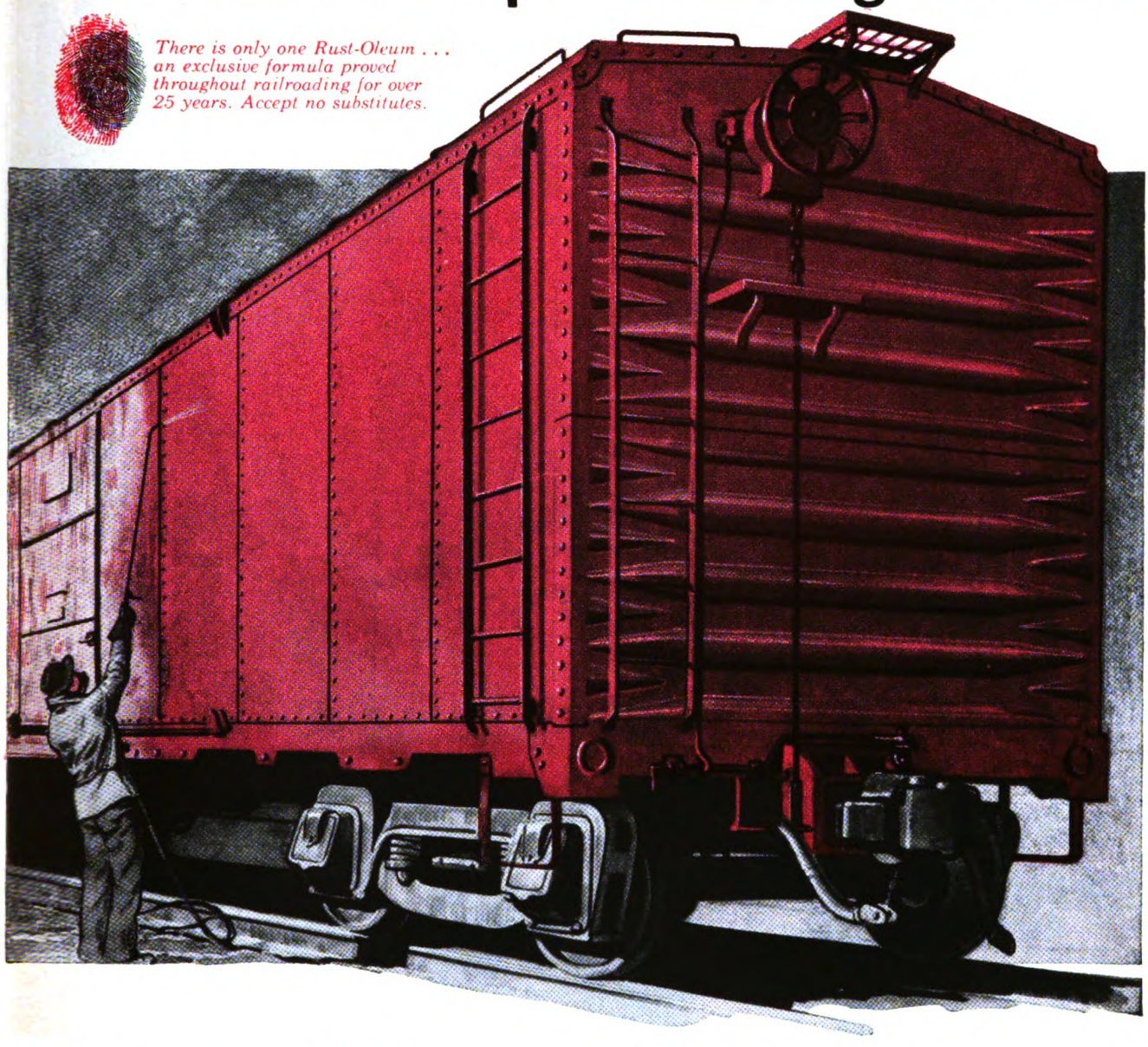
M. B. DOWDY, assistant chief mechanical officer, appointed superintendent motive power and equipment, Carolina shops, Norfolk, Va. Former position abolished.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
January, 1951	2,840,847	2,870	8,436	11,306	251,269
January, 1952	2,824,298	3,208	7,197	10,405	271,437
1953					
January	2,828,906	2,219	4,123	6,342	446,059
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256

RUST-OLEUM keeps 'em looking like this!

There is only one Rust-Oleum . . . an exclusive formula proved throughout railroading for over 25 years. Accept no substitutes.



RUST-OLEUM®

STOPS RUST!

Protect *new* metal surfaces . . . save even *badly rusted metal!*—and cut maintenance costs, too. Simply scrape and wirebrush to remove rust scale and loose particles . . . then brush Rust-Oleum 769 Damp-Proof Red Primer directly over the *sound rusted surface.* Sandblasting, chemical pre-cleaning and other costly preparations are *not* usually required. You save time, money, and metal on bridges, rolling stock, signal equipment, tanks, buildings, towers, etc. See how Rust-Oleum can save you money . . . why major railroads all over the country rely upon Rust-Oleum. Get the *complete* story from a Rust-Oleum Railroad Rust Preventive Specialist!

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2591 Oakton Street, Evanston, Illinois

Write for your copy of the new Rust-Oleum Catalog, *today!* Available in many colors, aluminum, and white.

FOR SUPERIOR RESISTANCE to ABRASION and CORROSION

Specify STRATOFLEX FLEXIBLE HOSE No 225

Built to give long service where conditions are especially rough on hose lines. Reinforced with high tensile strength wire braid with outer cover of tough synthetic rubber. In bulk Hose or Hose Assemblies with Stratoflex "over the cover" detachable, re-usable fittings. Write for your FREE catalog or order through your dealer.

★ Hose Assemblies

★ Re-usable Hose Fittings

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General Offices—P. O. Box 10398
Fort Worth, Texas
Branch Plants—Los Angeles and Toronto
Sales Offices—Atlanta, Chicago, Dayton, Houston, Kansas City, Los Angeles, Portland, New York, Toronto, Tulsa

Southern

Atlanta, Ga.

ELBERT L. MACDONALD appointed assistant foreman roundhouse.

JAMES C. DURHAM appointed general foreman car repairs (night).

Hayne Shop, Spartanburg, S. C.

JAMES F. HOLBROOK appointed assistant foreman car shop.

JAMES C. POPE appointed foreman car repairs.

Obituary

THOMAS W. DEMAREST, 87, who retired in 1938 as general superintendent motive power of the Pennsylvania at Philadelphia, died March 7.

SUPPLY TRADE NOTES . . . . . .

BALDWIN-LIMA-HAMILTON CORPORATION, STANDARD STEEL WORKS DIVISION.—*C. J. McGowan* has been appointed sales engineer in western Pennsylvania and West Virginia, with office in Pittsburgh. Mr. McGowan was formerly associated with Kropp Forge Company at Chicago.

■

MORTON MANUFACTURING COMPANY.—*Robert K. McKenzie*, chief engineer of Morton's Libertyville plant, has been appointed sales engineer. He will serve as direct assistant to *Robert S. Morton*, vice-president, now in charge of the railroad division.

■

TRANSPORTATION PRODUCTS COMPANY.—*James A. King*, formerly vice-president in charge of railway sales, Morton Manufacturing Company, has joined the Transportation Products Company as a sales representative at Chicago.

■

LUNKENHEIMER COMPANY.—*Melvin W. Pauly*, general sales manager, has been elected vice-president in charge of sales, and *Earl F. Ripelle* has been elected vice-president in charge of engineering and research.

■

J. B. Sewell

GARLOCK PACKING COMPANY.—*J. B. Sewell*, general sales manager, has been elected a vice-president, in which position he will continue to direct sales operation.

Mr. Sewell started with the Garlock Pacing Company of Canada, in 1935 as a sales representative in the Montreal area. In 1947 he was elected vice-president of that company. On October 1, 1954, he was transferred to the United States and appointed general sales manager, covering both Canada and the United States.

CUMMINS ENGINE COMPANY.—*Paul J. Every* has been appointed assistant general sales manager at Columbus, Ind.

■

R. M. HOLLINGSHEAD CORPORATION.—The *Brandon Equipment Company*, 332 South Michigan avenue, Chicago, has been appointed distributor of Hollingshead products to the railroad industry.

■

U. S. INDUSTRIES, INC.—The New York and Chicago executive offices of U. S. Industries are now located at 250 Park avenue, New York 17.

■

INDUSTRIAL BROWNHOIST CORPORATION.—*Marshall A. Norby*, sales representative, has been appointed district sales manager at Chicago, succeeding *A. P. Lyvers*. *Richard E. McCoach*, sales

Try both—ON US!

Works in seconds!

Loosens Rusted Bolts
nuts . . . screws . . . parts
LIQUID WRENCH

A powerful blend of quick-acting solvents that frees "frozen" parts without breakage. Safe for all metals and alloys.

Makes joints LEAKPROOF!
TiteSeal
GASKET & JOINT SEALING COMPOUND

7 BASIC BLENDS

Makes all assemblies leakproof and pressure-tight. Easy to apply with brush-in-handle.

- NON-SOLVENT—WILL NOT HARDEN
- WILL NOT SHRINK, CRACK OR CRUMBLE
- HEATPROOF AND VIBRATION-PROOF

Write for FREE sample

TWO of the many famous SOLDER SEAL products available from your Automotive, Plumbing or Hardware wholesaler.

RADIATOR SPECIALTY COMPANY
Charlotte, N. C.

Cuts down "DRAG"... cuts operator fatigue

The new, lightweight, U. S. ROYAL GOLD Fluted Welding Cable

No more energy wasted on handling heavier, less flexible welding cables. U.S. Royal Gold *Fluted* Welding Cable not only cuts down "drag" and operator fatigue, but also facilitates welding in cramped quarters.

EXCLUSIVE! U. S. Royal Gold's unique yellow jacket of 60% natural rubber provides unbeatable visibility, reduces the hazard of accident which is present with *black* cable. Also, the yellow jacket provides an excellent contrasting color to black for conductor identification when two cables are required on welding machines.

HIGH VISIBILITY!

LONGER LIFE! The greater flexibility of U. S. Royal Gold means greater dependability at terminal connections, minimum maintenance. Higher visibility of yellow jacket, reduces danger of accidental damage, adds more life to cable.

COOLER TO HANDLE! The unusual *fluted* jacket provides greater surface area and thereby dissipates heat faster.

SUPERIOR IMPACT RESISTANCE! Proved by tests to be greater than that of conventional constructions.

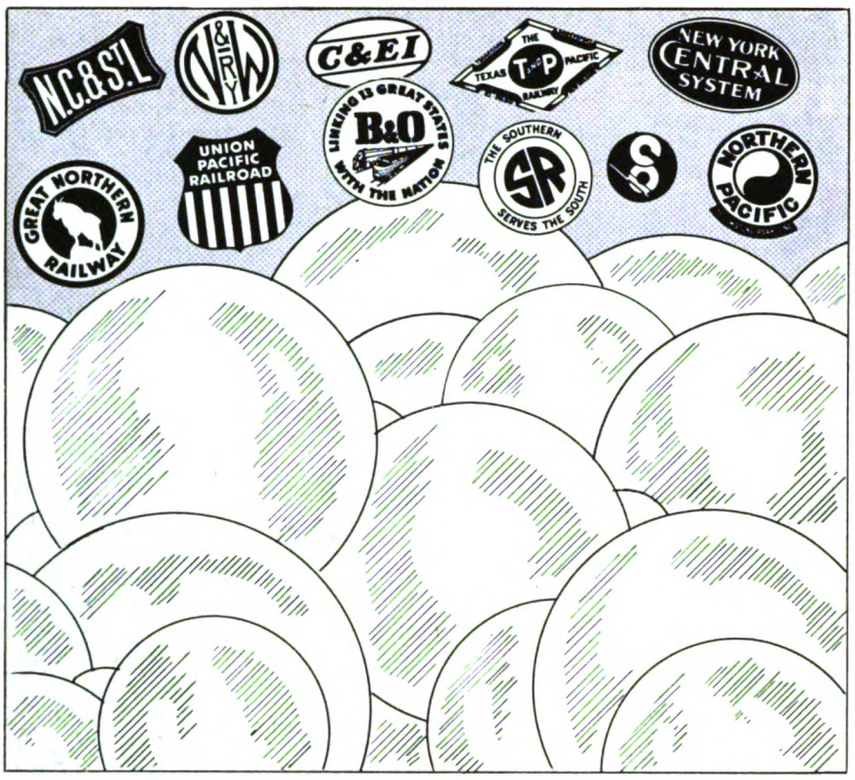
GREATER MOISTURE RESISTANCE! That's because of the special 60% natural rubber insulation. Added protection is provided by the jacket, also of 60% natural rubber. Get U. S. Royal Gold at electrical supply houses.

Write address below for free folder that gives facts demonstrating the superiority of U. S. Royal Gold Fluted Welding Cable.

US RUBBER

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department • Rockefeller Center, New York 20, N. Y.



Tough-skinned bubbles detect air leaks *instantly!*

The simplest and most effective way to locate air line and reservoir leakages is by the use of a soap solution.

For several years, Magnus 51-B has been a standard item on many railroads throughout the country. Solutions of Magnus 51-B produce large, tough-skinned bubbles wherever air leaks appear. It has an important advantage over ordinary soap solutions in that it does not form thick, hard-to-use jells in cold weather.

Magnus 51-B is a fine powdered soap and contains over 50% more real soap than do paste-type soaps usually marketed for similar purposes. It dissolves quickly and completely even in cold water. Recommended for air leak detection both on the test bench in the shop and on equipment in the yard.

If you are not already using Magnus 51-B, we invite you to try a drum, subject to guaranteed satisfaction or cancellation of the invoice.

magnus CLEANERS

Railroad Division

MAGNUS CHEMICAL CO., INC.

77 South Avenue, Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., Montreal

Representatives in All Principal Cities

representative at Philadelphia, succeeds *J. A. Peppard* as district sales manager at Cleveland. Messrs. Lyvers and Peppard are now consultants on special assignments.

■

A. C. Fecht

LEWIS BOLT & NUT CO.—*Anthony C. Fecht* has been appointed vice-president in charge of sales.

Mr. Fecht began with Lewis Bolt & Nut 27 years ago as a shop weigher and became assistant to the superintendent in 1944. He entered railway sales in 1945 and became general manager of sales for industrial fasteners, job hot-dip galvanizing and other allied departments of the company in 1952.

■

G. W. Gobrecht

MINK-DAYTON, INC.—*George W. Gobrecht*, has been appointed assistant to president and general sales manager of Mink-Dayton, Inc. Mr. Gobrecht was previously chief project engineer of the Railway division of Budd Company.

■

RAILROAD SUPPLY & EQUIPMENT, INC.—*Frank E. Ross* of the Ross Company, 3408 Washington boulevard, St. Louis, has been appointed sales representative for all products of Railroad Supply & Equipment, Inc., at St. Louis.

■

OLIVER IRON & STEEL CORP.—*John H. Van Moss, Sr.*, who recently retired from ACF Industries, Inc., has joined his

son, *John H. Jr.*, in his activities as a manufacturers sales representative and are now sales representatives to railroads and railroad equipment companies in the Chicago, St. Louis and Omaha territory for Oliver & Iron & Steel.

MILLER BEARINGS COMPANY.—*Earle M. Harshbarger*, formerly railroad sales manager, SKF Industries, Inc., has become associated Miller Bearings Company, Lakeland, Fla., as manager of the railroad department.

■

AMERICAN BRAKE SHOE COMPANY, BRAKE SHOE & CASTINGS DIVISION.—*Charles R Joyce* has ben appointed eastern sales manager and *Daniel C. Poor*, district sales manager.

Mr. Joyce, formerly sales representative, joined Brake Shoe as an apprentice in 1948. He was appointed sales representative at Cleveland in 1950. He now is located at New York.

Mr. Poor started as a sales representative with Brake Shoe in 1948. Formerly located at the company's Chicago offices, he will now be located at their Cleveland offices.

■

H. R. Deubel

CHICAGO PNEUMATIC TOOL COMPANY.—*Harry R. Deubel*, western division manager, railroad sales, who has been appointed manager, railroad sales division, with headquarters remaining in Chicago.

■

A. M. BYERS COMPANY.—Byers has consolidated its sales and order department into a single unit, known as the sales-order department. *L. G. Hubbell*, formerly manager of the order department, is manager of the new department, and *C. H. Flinn*, chief clerk of the sales department, is assistant manager.

■

AXELSON MANUFACTURING COMPANY.—*Arthur F. White* has been appointed Detroit district manager, in charge of district factory sales for the Lathe and Milling Machine Divisions.

■

ARO EQUIPMENT CORPORATION.—*J. Edwin Heath* has been appointed division manager in the sales department, covering North and South Carolina, Virginia, Western Virginia and Tennessee. *Gene R. Voight* has been appointed assistant to the general manager of the Air Tool Division, with headquarters in Bryan, Ohio. *Don L. Anderson* has been appointed assistant division manager in the greater Milwaukee area.

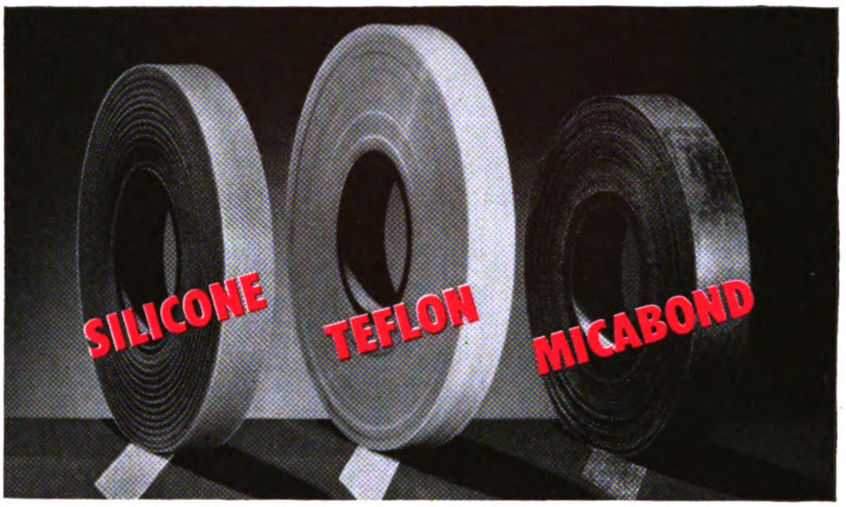
■

COOPER-BESSEMER CORPORATION.—*Fletcher Devin* has been elected a vice-president.

Mr Devin, who started with the original C & G Cooper Company in 1919, became branch manager of the company's office at Dallas, Tex., in 1924, and district manager at Mount Vernon, Ohio, in 1926. For the past 20 years he has directed the development of Cooper-Bessemer's locomotive markets for diesel engines. He is now also district sales manager for the engineering and sale of engine-driven compressors used in gas pipeline transmission and in refinery service in Ohio, Kentucky, Michigan, West Virginia, and Tennessee.

Obituary

CECIL R. MILLS, 76, retired vice-president and director of the Simmons-Boardman Publishing Corporation, publishers of *Railway Locomotives and Cars*, died at Daytona Beach, Fla., March 28.



Three C-D-F TAPES to meet your heat and electrical insulating needs

C-D-F Silicone Tapes for A.I.E.E. Class H Electrical Insulation. Available in Varnished Fiberglas cloth and Silicone Rubber-coated Fiberglas cloth. Resistant to high temperatures; high dielectric strength, low dielectric losses, excellent moisture resistance and high tensile strength. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated solvents. Available in a range of sizes on continuous rolls. Write for Technical Bulletin #47.

C-D-F Tapes of Teflon* have the desired mechanical and electrical properties for heavy duty motor, generator, and conductor insulation. Unaffected by temperature fluctuations, exposure to oils and greases, or weather conditions. Fiberglas supported and unsupported Teflon tapes are available in a range of sizes.

C-D-F Micabond Tapes have an inherently high and permanent resistance to heat with good dielectric properties. Micabond Tapes are used for insulating motor and generator armature and field coils, turbogenerator coils, and many similar applications where flexible high quality insulation of A.I.E.E. Classes B and H insulators are required. Available in a wide range of sizes with many different backings including: fiberglas, silk, Cellophane*, cotton, paper, and Mylar*.

If you have an insulating problem, probably a C-D-F product is the answer. C-D-F manufactures and fabricates electrical insulation, laminated and molded plastics. Sales offices are located in principal cities. Call your C-D-F sales engineer—he's a good man to know!

*du Pont trademarks.

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NEWARK 104, DELAWARE

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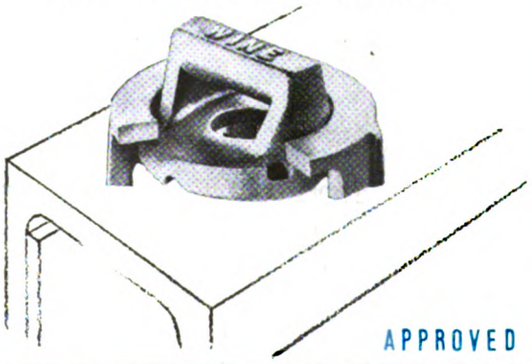

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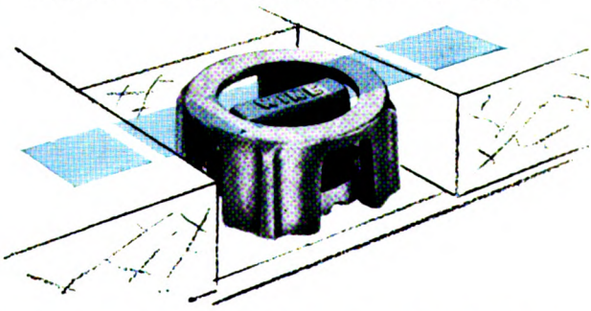

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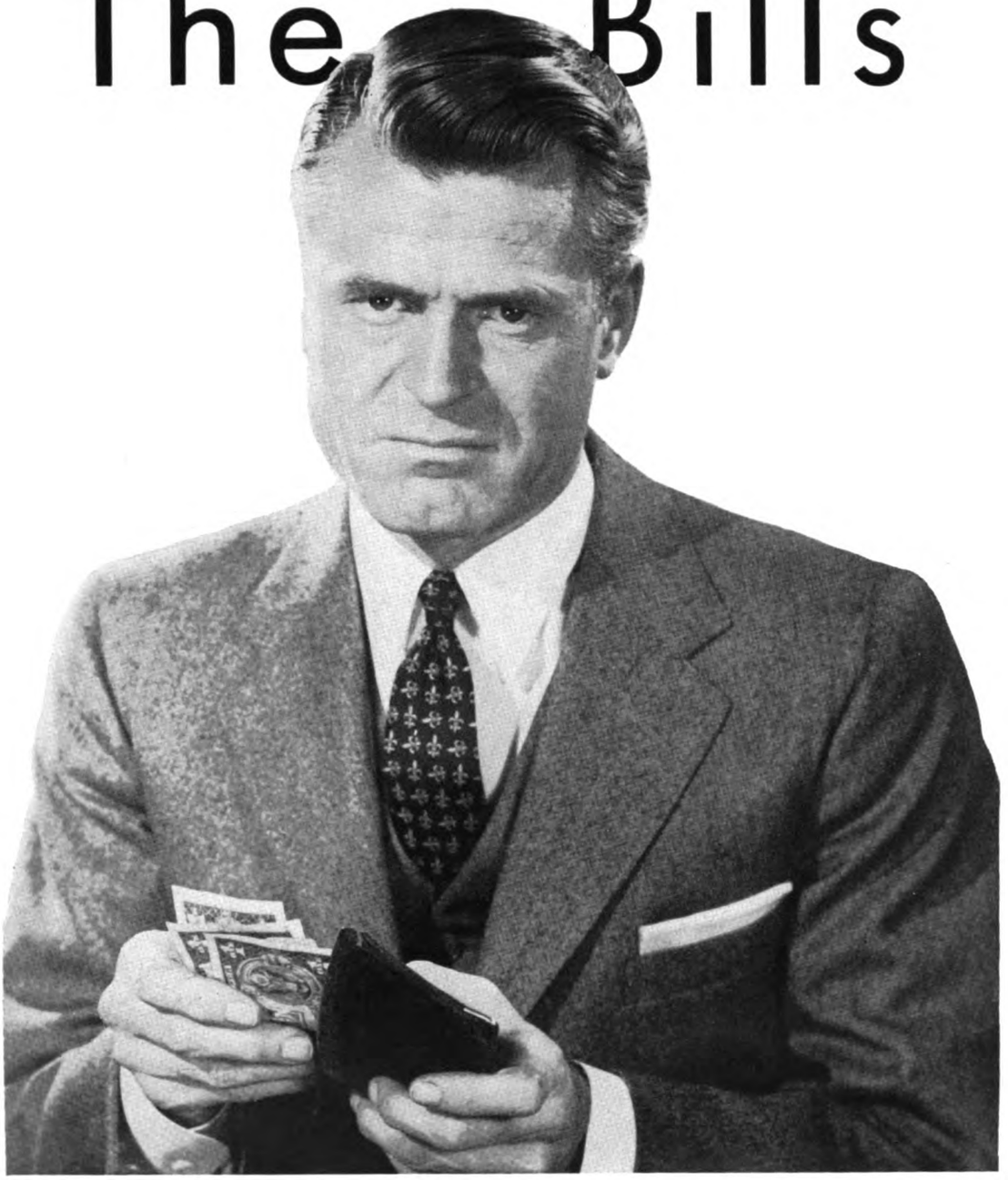

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Founded in 1832 as the American Rail-Road Journal

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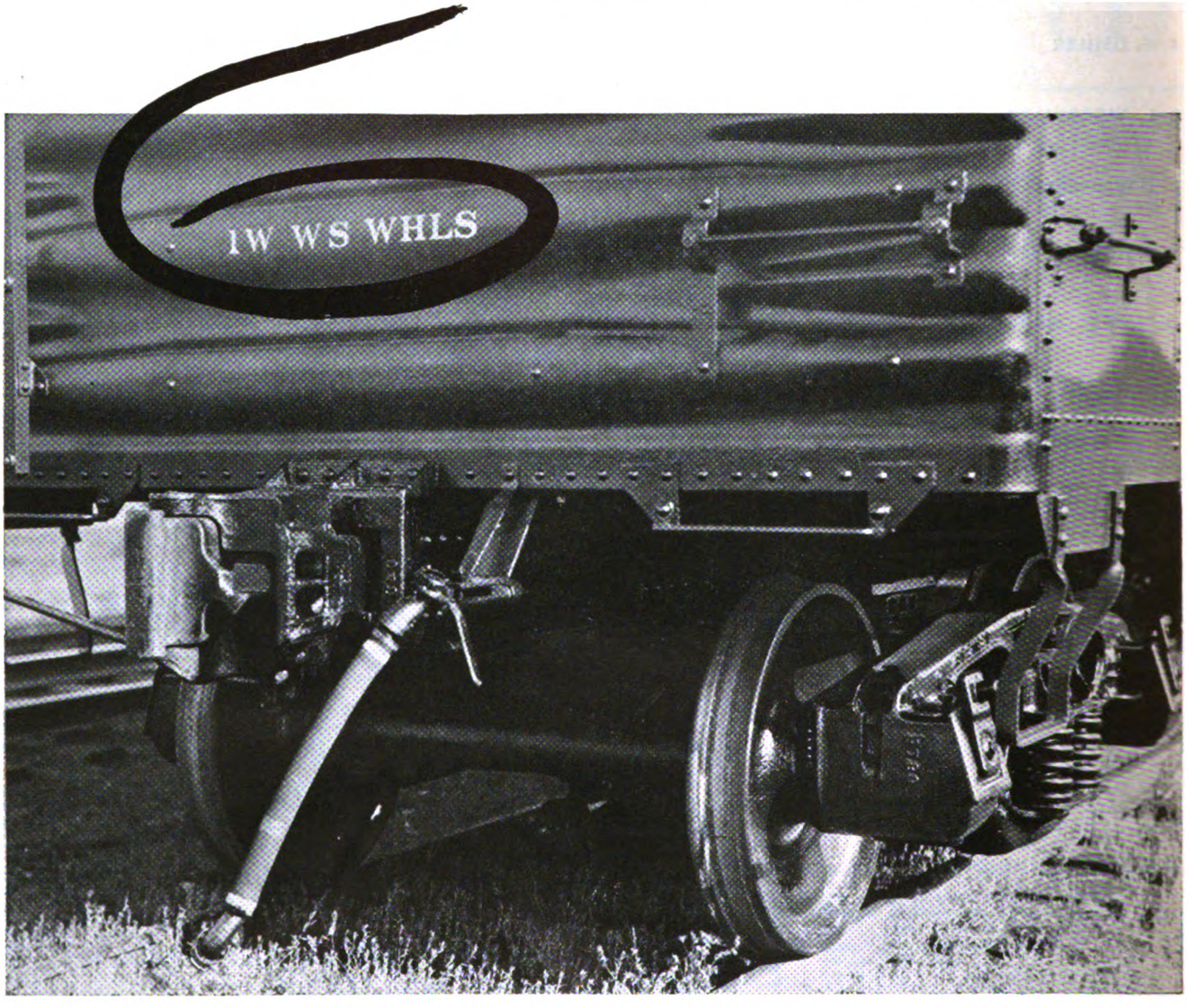

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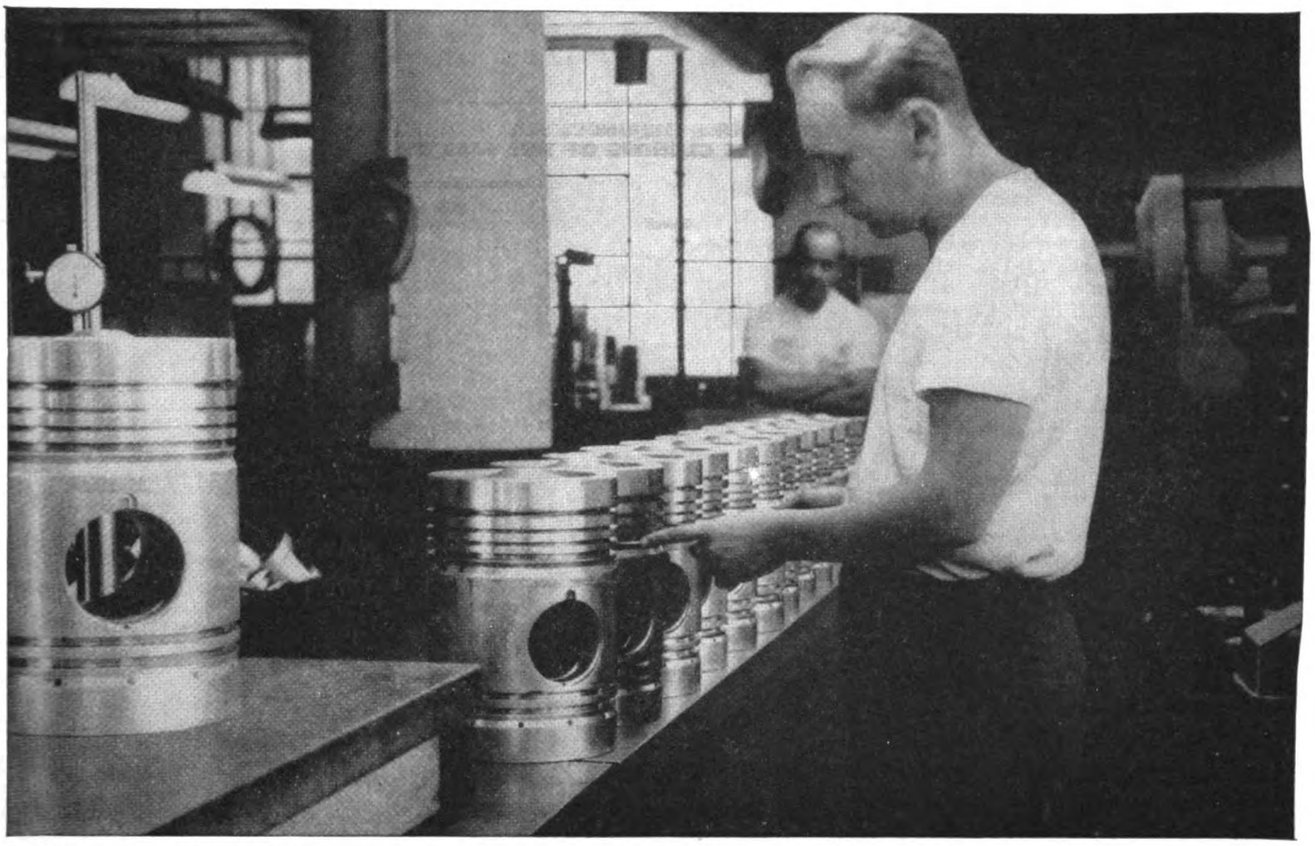

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NEWS

Mechanical Division To Meet At Montreal June 21-23

The sessions of the 28th annual meeting of the Mechanical Division, Association of American Railroads, will be held in the Ball Room of the Sheraton-Mt. Royal Hotel, Montreal, June 21, 22 and 23. The meeting will convene at 10 a.m., daylight saving time, Tuesday, June 21. It will be a joint session of the Mechanical Division with the Electrical Section of the Mechanical and Engineering Divisions. The program for the meeting is as follows.

TUESDAY, JUNE 21

Joint Session

10 a.m.

Address by N. R. Crump, president, Canadian Pacific.

Address by R. G. May, vice-president, Operations and Maintenance Department, AAR.

Mechanical Division

Address by D. S. Neuhart (chairman), general superintendent motive power and machinery, Union Pacific

Action on Minutes of 1953 meeting

Appointment of Committees on Subjects, Resolutions, etc.

Unfinished business

New business

Report of General Committee

Report of Nominating Committee

Dicussion of reports on:

- Locomotives
- Axles
- Geared Hand Brakes
- Safety Appliances
- Specifications for Materials

WEDNESDAY, JUNE 22

9:30 a.m.

Address by The Honorable Owen Clarke, member, Interstate Commerce Commission.

Discussion of reports on:

- Arbitration
- Prices for Labor and Materials
- Brakes and Brake Equipment
- Loading Rules

Luncheon

Address by S. F. Dingle, vice-president—operations, Canadian National, at luncheon sponsored by Canadian Railway Suppliers' Committee

Afternoon

Discussion of reports on:

- Special Committee on Forest Products Loading
- Couplers and Draft Gears
- Lubrication of Cars and Locomotives
- Wheels

THURSDAY, JUNE 23

9:30 a.m.

Address by C. G. A. Rosen, Caterpillar Tractor Company.

Discussion of reports on:

- Tank Cars
- Car Construction

Election of members of General and Nominating Committees

Report of Committee on Resolutions

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE MAY ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Canadian National	1	1,750		General Motors Diesel, Ltd.
	1	2,400	"Trainmaster" general purpose	Canadian Locomotive
Northern Pacific	33[1]	1,750	Road switching	Electro-Motive
	1A[1]	1,750	Freight	Electro-Motive
	3[1]	1,200	Switching	Electro-Motive
	1[1]	1,600	Road switching	Alco Products

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Canadian National	200	50-ton refrigerator	National Steel Car
	30	30-ton ore	Marine Industries, Ltd.
Chesapeake & Ohio	250[2]	Box	Pullman-Standard
	250[2]	Box	ACF Industries
Chicago, Rock Island & Pacific	100[3]	70-ton covered hopper	Pullman-Standard
Erie	300[4]	50-ton box	Greenville Steel Car
	200[4]	50-ton box	General American Trans.
Louisville & Nashville	200[5]	50-ton pulpwood	ACF Industries
New York Central	200	70-ton covered hopper	Despatch Shops
North American Car Corp.	55[6]	70-ton covered hopper	Pullman-Standard
St. Louis Southwestern	50[7]	50-ton pulpwood	Company shops
Southern Pacific	350[8]	70-ton hopper	Pullman-Standard
Western Maryland	50[9]	50-ton box	General American Trans

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Canadian National	20[10]	Baggage	National Steel Car

[1] Delivery scheduled for third quarter of this year.
[2] This order for 500 cars was incorrectly reported in the May issue as having been placed entirely with Pullman-Standard.
[3] Cost per unit, $7,350. To have been delivered in April and May.
[4] The Greenville cars will be 50 ft, equipped with double doors and Armco steel floors. The GAT cars will be equipped with damage-free stowing devices for shipping automobile parts and other freight. Deliveries of the former expected to start July 15; deliveries of the latter to begin in September. Estimated cost of the 500 cars, $4,500,000.
[5] Estimate,d cost, $1,100,000. Delivery expected in July.
[6] Estimated unit cost, $7,600. To have been delivered in May.
[7] Estimated cost, $257,000. To be delivered during June and July.
[8] Cost to exceed $3 million. To be delivered during June and July.
[9] Estimated cost, $425,000. To be delivered during June.
[10] For delivery late this year.

NOTES:

Bessemer & Lake Erie.—The B&LE will place 250 of its 70-ton hopper cars in the shops of the Greenville Steel Car Company for heavy repairs. Work is scheduled to begin in August.

Delaware, Lackawanna & Western.—The Lackawanna will convert 84 additional hopper cars into flat cars for piggyback service at a cost of $420,000. Work will be done in company shops.

Seaboard Air Line.—The SAL will rebuild in its own shops 300 50-ton gondola cars at an approximate cost of $987,000.

Shippers' Car Line Corporation.—Shippers', an ACF Industries subsidiary, has announced a new type container car for bulk movement of powdered or granular products, 1,000 of which are expected to be in operation within five years. Each car has 28 separate aluminum containers, all of which, it is said, can be unloaded by one man in one hour.

Western Pacific.—The directors of this road have authorized the purchase of eight 1,750-hp general purpose diesel units at an approximate cost of $1.5 million.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
February, 1951	2,425,226	4,528	14,063	18,591	130,452
February, 1952	2,809,162	2,723	6,473	9,196	305,477
1953					
January	2,828,906	2,219	4,123	6,342	446,059
February	2,625,563	2,111	4,059	6,170	425,537
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701

Welding Show

New applications of the welding process for industry will be the theme of the American Welding Society's Welding Show which will be held at the Municipal Auditorium, Kansas City, Mo., June 8 to 10. Technical sessions of the society's national spring meeting, which will start a day earlier, also will emphasize new uses for welding.

New Freight-Car Cushioning Device Being Tested on SP

A new freight-car cushioning device, developed by the Southern Pacific in cooperation with the Stanford Research Institute, is being tested by the railroad, D. J. Russell, SP president, has announced. Mr. Russell said the device, on which the SP is seeking patents, shows considerable promise, but that research and development will continue for possible refinements in design to make the device more suitable for volume production.

The device consists essentially of a friction brake actuated by a hydraulic mechanism built into a modified freight car underframe to cushion the shock when cars are coupled. Couplers are attached to a car-length sill "floating" inside the fixed-car underframe. Movements of this sill are slowed by the braking action of the hydrafriction unit, which is automatically in direct proportion to the force on either coupler. Adjustment between impact and cushioning reaction is said to be instantaneous.

Mr. Russell said the new device was first built and tested as a pilot model, then improved and built full size into a freight car constructed at the SP's Sacramento, Cal., shops. The prototype car is now in test service. Its performance, under various operating conditions, is being checked by the road's department of research and mechanical standards as well as by representatives of its freight protection, merchandise and station service. Because the new device makes use of a special design underframe, the SP chief executive pointed out, it cannot be applied to old cars, but if successful, will be built into other cars being built at Sacramento.

See page 61 for a detailed description of this device.—Editor.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of February 1955	Month of February 1954	2 months ended with February 1955	2 months ended with February 1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	4,626	6,685	9,429	14,567
3-06	Total, Diesel-electric	31,789	29,055	65,862	60,149
3-07	Total, electric	634	614	1,332	1,237
3-04	Total, locomotive-miles	37,239	36,429	77,027	76,099
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,464	1,380	2,993	2,848
4-06	Empty, total	809	814	1,717	1,678
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	10,437	12,541	20,976	27,508
6-02	Total in oil-burning steam locomotive trains	1,174	2,494	2,414	5,112
6-03	Total in Diesel-electric locomotive trains	88,368	80,145	182,166	164,406
6-04	Total in electric locomotive trains	1,900	1,878	4,003	3,726
6-06	Total in all trains	102,524	97,316	210,912	201,242
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.02
10-02	Loaded freight car-miles	42.10	40.60	41.60	40.20
10-03	Empty freight car-miles	23.30	24.00	23.80	23.60
10-04	Total freight car-miles (excluding caboose)	65.40	64.60	65.40	63.80
10-05	Gross ton-miles (excluding locomotive and tender)	2,946	2,861	2,930	2,838
10-06	Net ton-miles	1,325	1,260	1,306	1,252
12	Net ton-miles per loaded car-mile (M-211)	31.50	31.00	31.40	31.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.40	62.90	63.50	62.90
14	Averages per train hour (M-211):				
14-01	Train miles	18.80	18.90	19.00	18.80
14-02	Gross ton-miles (excluding locomotive and tender)	54,975	53,538	55,201	52,914
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	44.70	42.20	44.10	41.40
14-02	All	41.90	40.10	41.30	39.40
15	Average net ton-miles per freight car-day (M-240)	850	784	824	772
17	Per cent of home cars of total freight cars on the line (M-240)	50.60	53.60	51.70	53.60

PASSENGER SERVICE (DATA FROM I.C.C M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,233	2,438	2,683	5,334
3-06	Diesel-electric	19,064	19,063	40,282	40,290
3-07	Electric	1,273	1,323	2,688	2,819
3-04	Total	21,571	22,825	45,654	48,444
4	Passenger-train car-miles (000)				
4-08	Total in all locomotive-propelled trains	214,910	227,429	457,964	484,844
4-09	Total in coal-burning steam locomotive trains	7,265	12,588	15,712	27,788
4-10	Total in oil-burning steam locomotive trains	2,577	7,285	6,439	16,283
4-11	Total in Diesel-electric locomotive trains	190,554	192,676	405,155	409,232
12	Total car-miles per train-miles	9.60	9.59	9.67	9.65

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000:)				
1-01	Steam, coal-burning	236	321	476	695
1-02	Steam, oil-burning	37	52	79	105
1-03	Diesel-electric[1]	3,234	3,071	6,653	6,379
1-06	Total	3,515	3,456	7,222	7,201
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	9	12	19	27
2-02	Steam, oil-burning	4	4	9	8
2-03	Diesel-electric[1]	230	237	486	504
2-06	Total	268	279	565	595
3	Hours per yard locomotive-day:				
3-01	Steam	4.80	4.90	4.60	4.90
3-02	Diesel-electric	15.50	15.30	15.20	15.10
3-05	Serviceable	15.30	14.60	15.00	14.40
3-06	All locomotives (serviceable, unserviceable and stored)	13.10	12.40	12.90	12.30
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.66	1.73	1.67	1.75
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.77	.76	.76	.76

[1] Excludes B and trailing A units

PERSONAL MENTION

Baltimore & Ohio

FRANCIS B. RYKOSKEY, superintendent of motive power at Pittsburgh, Pa., appointed assistant general superintendent of motive power and equipment, with headquarters in Baltimore, Md. *Education*: St. Bonaventure's Preparatory School; West Liberty State Teachers College (G.A. 1933); University of West Virginia; West Virginia Technical College. *Career*: Started as a machinist helper on B&O in Benwood, W. Va., in 1920. Subsequently became machinist, special inspector, diesel electrical supervisor at Baltimore, enginehouse foreman at Brunswick, assistant division master mechanic, and supervisor of shops at Baltimore. In 1950 appointed superintendent of motive power at Pittsburgh.

Boston & Maine

Mechanical engineering department transferred from Billerica, Mass., shops to the Industrial Building, Boston, where it is located with the Operating-Mechanical Department.

Central of Georgia

WILLIAM H. LEAVENGOOD, assistant mechanical engineer, appointed mechanical engineer at Savannah, Ga. *Education*: University of Florida—M. E. deg. *Career*: Began with the C of Ga in 1948 as mechanical draftsman. Appointed assistant mechanical engineer in 1949. A registered professional engineer in State of Georgia.

SIDNEY L. WALDHOUR, chief fire inspector, appointed research and test engineer, with headquarters at Savannah, Ga.

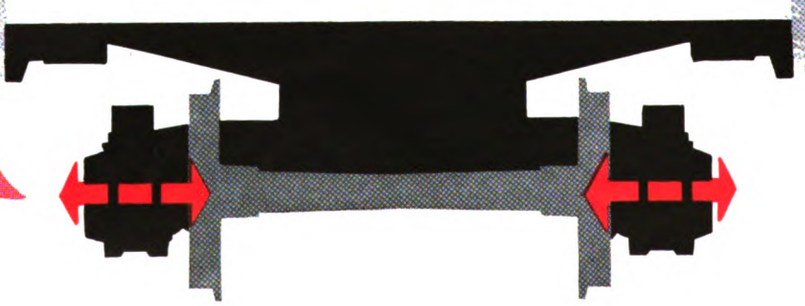
AAR accelerometer tests prove cars ride better with

FREE LATERAL

In the official AAR accelerometer road tests of various new high-speed freight car trucks conducted in recent years, **trucks equipped with bearings which permit free lateral movement of the journals consistently showed lower lading damage index ratios than the same trucks did when equipped with bearings which restrain lateral movement.**

It's a matter of record—free lateral substantially reduces wear and tear on wheel flanges, trucks and cars—cuts lading damage, too!

If you want the *full advantages* and *maximum economy* roller bearings can give you, don't be penalized by sacrificing free lateral. *Insist on* Hyatt Roller Bearing Journal Boxes.



HYATT

RUNNING MATE OF FASTER FREIGHT

ROLLER BEARING JOURNAL BOXES

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

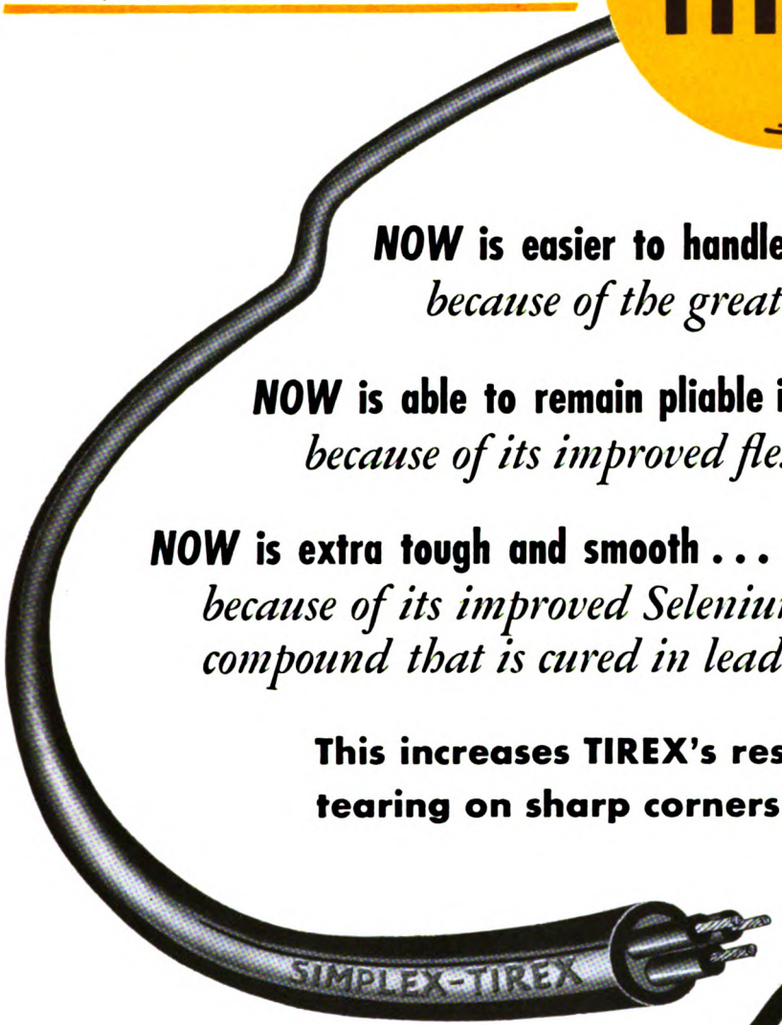
THE NEW IMPROVED TIREX CORD

NOW is easier to handle than ever before . . .
because of the great increase in its flexibility

NOW is able to remain pliable in even colder weather . . .
because of its improved flexibility at low temperatures

NOW is extra tough and smooth . . .
because of its improved Selenium Neoprene Armor compound that is cured in lead

This increases TIREX's resistance to snagging and tearing on sharp corners even more.



Simplex TIREX

For detailed information as to how the NEW, IMPROVED TIREX CORD can save time and effort for *you,* and cut down *your* maintenance costs, write to the address below for Folder 1022.

SIMPLEX WIRE & CABLE CO.
79 Sidney Street, Cambridge 39, Mass.

PERSONAL MENTION

(*Continued from page 9*)

Erie

FRANCIS P. LAWLER, diesel training instructor, has retired.

HAROLD C. WHITFORD, assistant supervisor of motor equipment, has been appointed to the newly created position of diesel maintenance instructor.

Norfolk & Western

W. B. STEVENS, gang foreman, electrical department, Roanoke, Va., shops, has retired.

H. J. CLENDENEN, gang foreman—electrical at Roanoke, Va., passenger station, appointed gang foreman, electrical department, Roanoke shops.

T. L. TAYLOR, gang leader at Roanoke, Va., shops, appointed gang foreman—electrical at Roanoke passenger station.

Pennsylvania

W. C. FLECK, master mechanic, Philadelphia Terminal and Atlantic Divisions and P.R.S.L., appointed assistant to engineer of tests at Altoona, Pa.

J. C. WHITE, master mechanic, Lake division, appointed master mechanic, Philadelphia Terminal and Atlantic Divisions and P.R.S.L.

W. H. LONG, assistant master mechanic, Altoona, Pa.. Middle Division, appointed master mechanic, Lake Division.

W. H. MILLER, foreman, Richmond, Ind., enginehouse, appointed assistant master mechanic, Altoona, Pa., Middle Division.

J. K. MCNEAL, III, foreman, Atlantic City enginehouse, appointed foreman, Richmond, Ind., enginehouse.

H. W. WITTMAN, assistant foreman, Paoli, Pa., car shop, Philadelphia Terminal division, appointed foreman, Atlantic City enginehouse.

F. K. NIELSEN, gang foreman, special duty, office of general superintendent motive power, Eastern Region, appointed assistant foreman, Paoli, Pa., car shop, Philadelphia Terminal division.

H. L. WOOD, assistant master mechanic, Philadelphia division, appointed assistant master mechanic, Pittsburgh and Conemaugh divisions.

Southern

Washington, D. C.

E. W. PREBLE, assistant shop engineer at Washington, appointed mechanical engineer.

OLIVER H. SMART, JR., appointed assistant shop engineer.

ROBERT F. REUBUSH, JR., appointed assistant shop engineer.

J. B. Rykoskey (B&O)

THOMAS L. SYKES appointed tool design engineer.

Atlanta, Ga.

EUGENE JARRELL appointed foreman electricians.

W. H. Leavengood (CofGa)

CLIFFORD S. SMITH, JR., appointed assistant foreman electricians.

WILLIAM J. PURDIE, JR., appointed assistant foreman roundhouse.

LESTER R. REDDY appointed foreman car inspectors.

SUPPLY TRADE NOTES . . . . . .

GUSTIN - BACON MANUFACTURING COMPANY.—*D. M. Vance* has been appointed to the sales force in the Chicago area. Mr. Vance was previously with the Nathan Manufacturing Company.

■

ALLIS-CHALMERS MANUFACTURING COMPANY.—*Robert S. Stevenson,* executive vice-president, has been elected president, succeeding *William A. Roberts,* deceased.

■

LUNKENHEIMER COMPANY.—*Melvin W. Pauly,* general sales manager, has been elected vice-president, sales.

■

SKF INDUSTRIES, INC.—SKF has acquired the controlling interest in *Tyson Bearing Corporation,* Massillon, Ohio, manufacturers of tapered roller bearings. Operations will continue under direction of the existing management, headed by *Harry I. Lewis,* president.

■

JOY MANUFACTURING COMPANY.—*Donald L. Archibald* has been appointed district sales manager, New England area, with headquarters in Boston. Mr. Archibald had been previously located at St. Louis.

■

ALCO PRODUCTS, INC.—The name of the *American Locomotive Company* has been changed to Alco Products, Inc., to reflect the diversified operations of the company.

William A. Powers has been appointed regional service manager and *C. S. Middleton,* renewal parts sales representative, both in the Chicago sales district.

■

BEAVER PIPE TOOLS, INC.—*Ned Dengler,* has been appointed district manager of sales in Southern Ohio, Indiana, West Virginia and Kentucky, with headquarters at Fremont, Ohio.

■

ARMSTRONG CORK COMPANY—The full line of Fiberglas industrial insulations manufactured by the *Owens-Corning Fiberglas Corporation* will also be produced for Armstrong Cork who will market them under the trade name "Armaglas."

■

LINCOLN ELECTRIC COMPANY.—*L. K. Stringham,* chief engineer, has been appointed vice-president in charge of engineering. *George Landis,* engineering vice-president, has been appointed vice-president in charge of research. *Norman J. Hoenie* and *Emmett Smith* have been appointed chief engineer, respectively, of the Machine and Electrode Divisions, of which they had previously been assistant chief engineers.

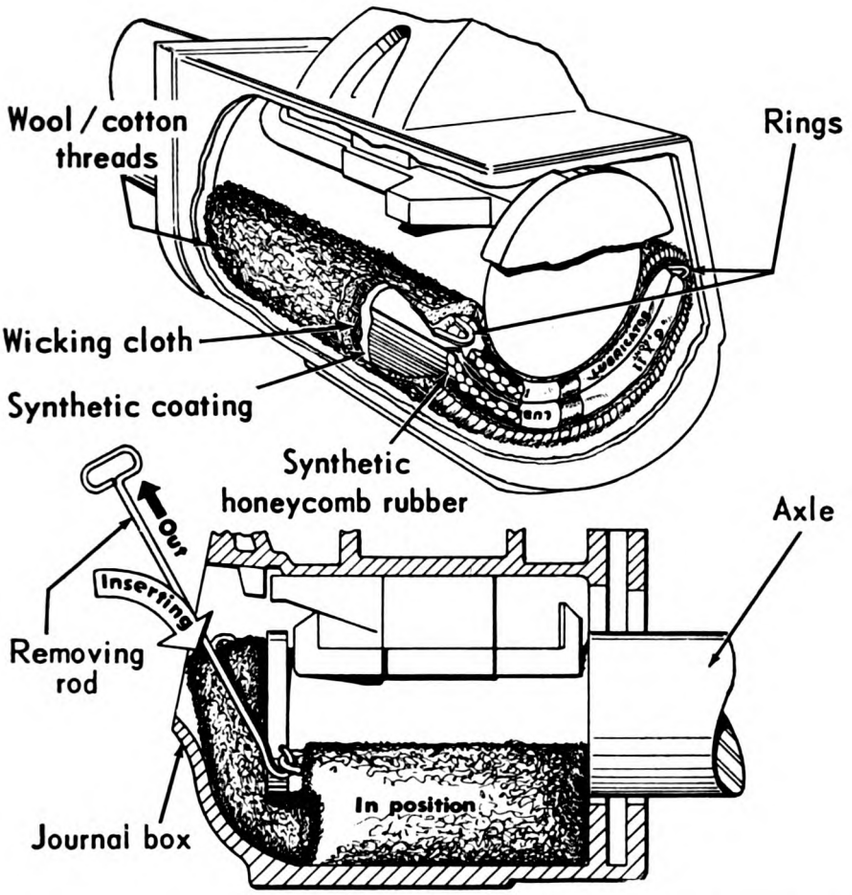
■

CLIMAX MOLYBDENUM COMPANY.—Climax has established three new divisions, including direct sales, metallurgical market development, and chemical market development. *Lars E. Ekholm* has been appointed manager of the sales division and *Norman L. Deuble,* manager of the metallurgical division, both with headquarters in New York. Diesel and other engines, gas turbines, and railroad equipment will be in a group under the metallurgical market development division. This group will be located in Chicago.

■

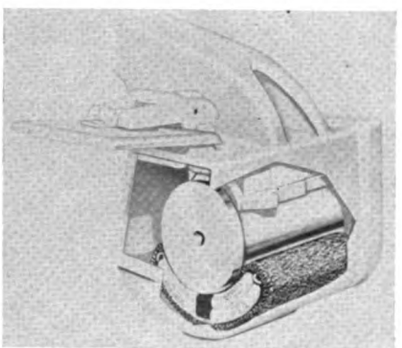
UNION CARBIDE & CARBON CORP.—New research laboratories, to be managed by the National Carbon Company, a division of Union Carbide & Carbon, are being built at Parma, Ohio, a suburb of Cleve-

(*Continued on page 102*)



Special rings are permanently attached to the lubricator so that it can be removed by a hooked rod

The lubricator pad can be inserted into the box without removing the wedge or brass nor jacking the box



The lubricator stays in place by its own spring-like action, and it can be turned upside down when the journal side wears out

Pad-Type Journal Box Lubricator

After two years of testing and modifying their new muff-type lubricator pad which substitutes for the waste in the journal box, the Miller Lubricator Company has released information on how the device works and how to service it.

The lubricator utilizes the principle of textile wick-action in supplying lubricating oil to car journals. It consists of a thick textile-faced blanket surrounding a canvas-covered springy synthetic rubber honeycomb core. Application does not require modification of existing journal boxes, jacking nor any special equipment.

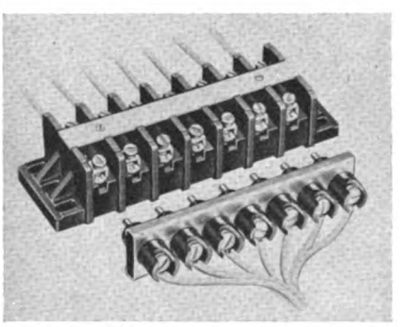
When placed in the journal box, the lubricator's textile blanket is immersed in oil at the bottom of the journal box, while the upper textile face is held firmly against the rotating journal by the spring-like support of the inner rubber honeycomb. Because loose waste is eliminated, the possibility of waste-grab, one of the frequent causes of hot boxes, is avoided.

Also eliminated is the danger of non-lubrication due to lack of sufficient waste, or waste that has slipped out of contact with the journal. So long as there is any oil present in the journal box, the textile blanket-facing of the lubricator exerts a wick-like action, drawing oil to its top side, with a wide, uniform area applying the oil to the journal.

The lubricator is expected to give a total service life of six years. One side will be next to the journal for the three years of the first re-pack period. As the device is identical on the top and bottom, it can be turned upside down for another three year's service.

Some oil savings are expected over the use of waste because, after application, only 5 lb oil need be added to the box in place of the usual 9 lb.

The AAR has approved use of the Miller Journal Lubricator for a 36-month re-pack period, on a limited number of cars, subject to the requirement that, for the present, inspection be made at the expiration of 18, 34 and 30-month intervals. *Miller Lubricator Company, Winona, Minn.*



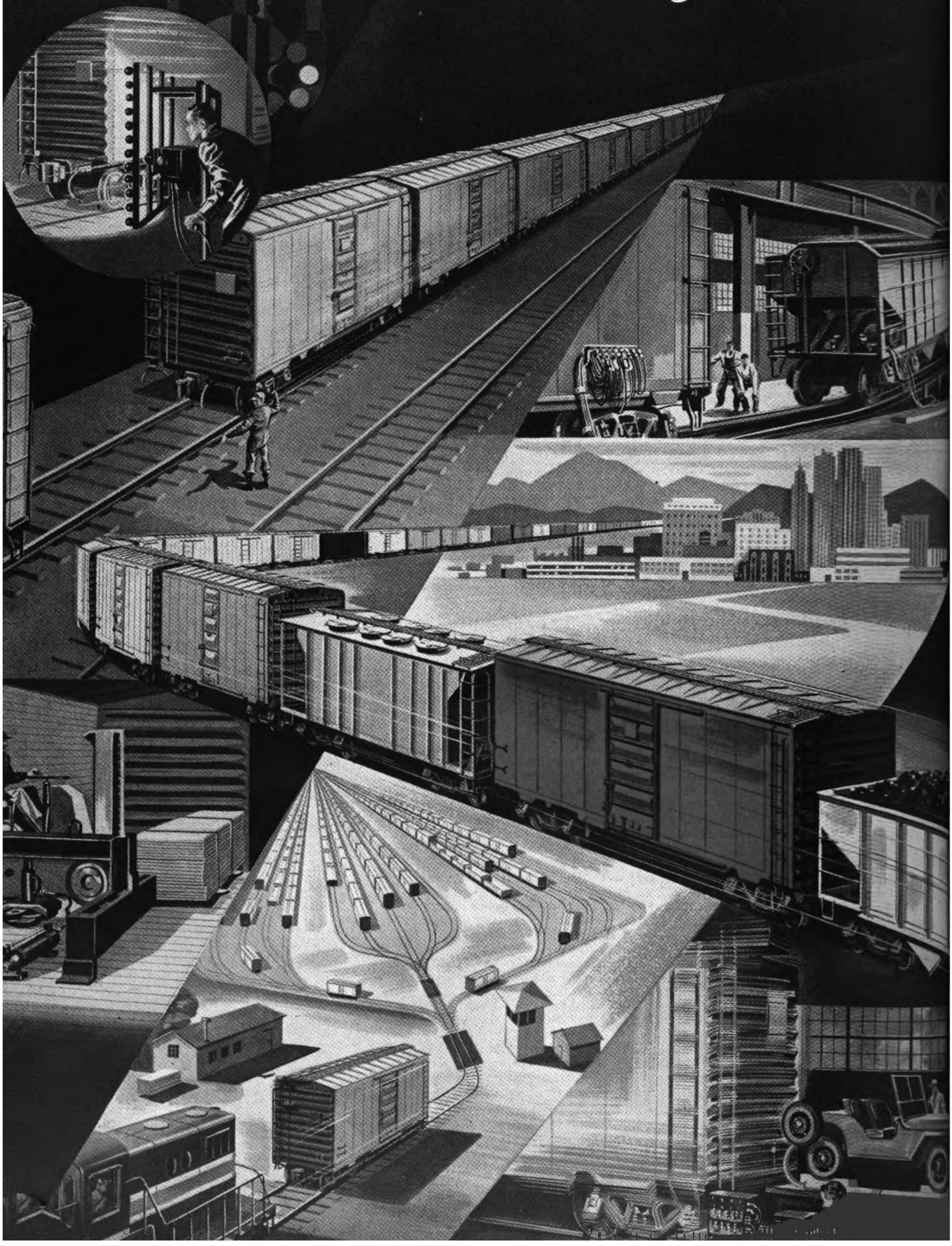
Plug-In Terminal Blocks

This multi-contact plug-in results from the combination of a Curtis Type FTLP terminal block and a Type RH block. Usage of these standard high-current blocks offers three advantages over the conventional type of multi-contact plug-in.

The manufacturer claims that it provides high pressure solderless anchoring of each individual connector for a positive low-resistance contact. The white marker strip on the RH block offers quick,

(*Continued on page 24*)

Stamina and economy are born



in a laboratory reproduction

of the

GREAT AMERICAN RAILWAY *System*

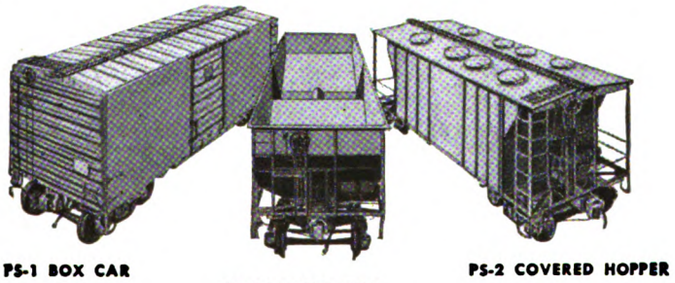
You could, simply by standing in Pullman-Standard's Research and Development Laboratory, give a blow by blow account of the daily life of a freight car operating anywhere on the Great American Railway System.* For here are reproduced the forces created by switching and humping, the vibrations caused by oscillating and shaking and the stresses traceable to heavy loads and shifting ladings.

These and other destructive effects of normal operation are measured by scores of scientific devices such as strain gauges, ocillographs and high speed movie cameras. It is only by means of such data that the clues to design problems can be found, that the cost and weight penalties of construction which exceeds a reasonable safety factor can be avoided.

The stamina and life-time economy of the PS-1 Box Car were created in the laboratory. And the "on line" inspection of representative numbers of the 57,000 now in use, verifies it. The PS-2 Covered Hopper and the PS-3 Hopper Car also have designed- and built-in stamina balanced with economy, as a result of this laboratory reproduction of operating conditions. All three are quality cars built to earn more ton miles of revenue at lower cost per year of service, wherever they are sent.

*A typical box car moves, in one year, on 39 different roads, including two or more trips on 24 roads. (A. A. R. data)

Built to serve best on the
GREAT AMERICAN RAILWAY SYSTEM



PS-1 BOX CAR

PS-3 HOPPER CAR

PS-2 COVERED HOPPER

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

79 EAST ADAMS STREET, CHICAGO 3, ILLINOIS

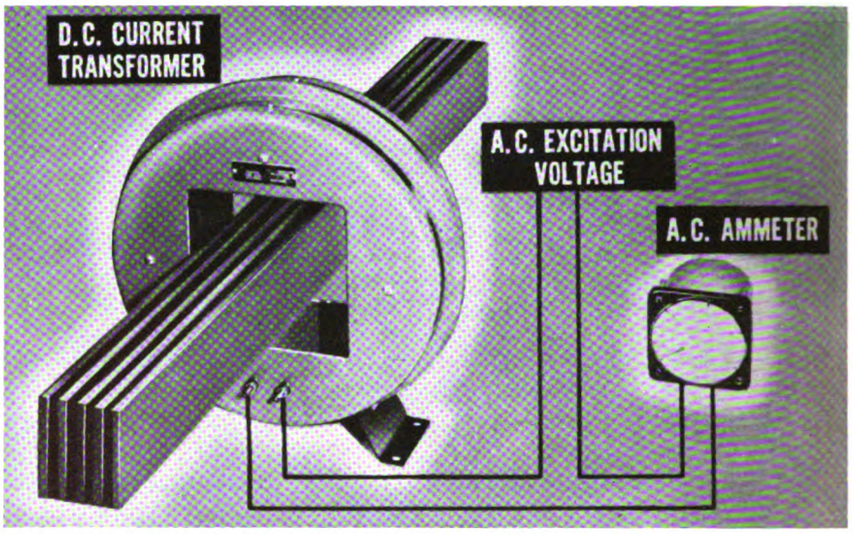
BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

(*Continued from page 21*)

convenient identification of circuits. A simple means of making any of multiple contacts without the high cost or a large stock of plugs is also claimed.

The FTLP block was designed for sub-panel and chassis connections where a soldered connection is desired. It is available factory assembled in any specified number of terminals from 1 to 16 and has ample clearance and leakage distances for use in circuits carrying up to 300 volts, 20 amp.

The RH block, serving as the female connector was designed for high-pressure solderless connections. It is factory assembled in any number of terminals from 1 to 20 and is rated at 750 volts, 50 amp. *Curtis Development & Manufacturing Co., 3266 North 33 Street, Milwaukee 16, Wis.*



D-c Current Transformer

The d-c current transformer provides for a permanent remote indication of large d-c currents with an isolated instrument circuit. An open center allows the JSU-1 transformer to be placed over the bus or cable without making contact with the d-c circuit. The unit was formerly designated as the d-c measuring reactor and it consists of a saturable core reactor and an a-c ammeter. An a-c excitation voltage is fed to the transformer and the magnitude of the d-c current is indicated by the variation in the a-c current passed by the transformer.

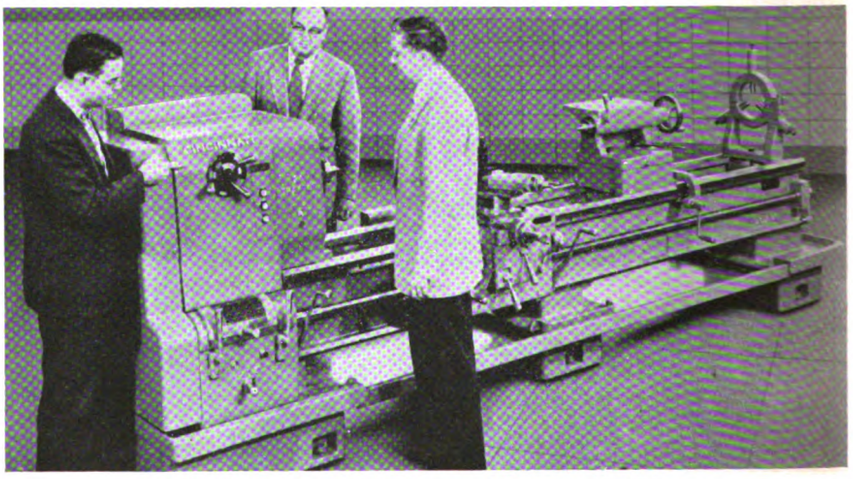
Applications for this device include not only visual indications but feedback sources for current balance regulators, d-c voltage regulators, motor field controls, and diesel-electric locomotive static excitation controls. There is a reduction of electrical hazard to personnel and equipment because the indicating instrument is isolated from the main bus voltage. Installation expense may be decreased because no shunts or special bolted bus connections are necessary. *General Electric Company, Schenectady 5, N. Y.*

Bar Type Puller

Power and versatility feature this industrial puller that provides up to 50 tons of power for machinery jobs. The unit is heat-treated to take the stresses and strains built up in breaking loose and removing rusted-on or tightly fitted gears, pulley wheels or similar objects.

The yoke is machined from 2½-in. square stock and is 16 in. long. Grooves for side rods extend to within a short distance of the center pressure screw so objects can be pulled with openings or tapped holes a minimum of 6 in. apart, center to center.

To make for extra rigidity of the side rods and to make the unit adaptable for pushing and pulling, an extra set of nuts is included which can be threaded on the rods to contact the underside of the yoke. For pulling large spoke wheels, two adapter blocks can be slid over the side rods and held in position by two nuts. This allows the puller to adapt to almost any type of wheel construction. *Snap-on Tools Corporation, Kenosha, Wis.*



Geared Head Tray-Top Lathes

These all-geared Tray-Top toolroom lathes, swinging 21½ in. and 26 in., have 12 spindle speeds in geometric progression, with a 3-lever, color match, direct-reading shift mechanism. The spindle, with long taper key drive nose, is rigidly mounted in three zero position anti-friction bearings. Diameter of the hole through the spindle is 1 13/16 in. for the smaller lathe, with a 2 7/16 in. diameter hole available on demand. The 2 7/16 in. spindle hole is standard for the larger lathe.

All headstock bearings, gears and shafts are pressure lubricated with filtered oil. A total of 54 thread and feed changes are made available through a totally enclosed, automatically lubricated quick change gear box, where a lever to reverse the lead-

(*Continued on page 28*)

...etter with USS COR-TEN steel since 1933

359 NEW PASSENGER CARS FOR CANADIAN NATIONAL

CANADIAN NATIONAL RAILWAYS

BUILT WITH USS COR-TEN STEEL

to provide greater safety and durability with lighter weight

● These new cars, 141 sleepers, diners and dinettes built by Pullman-Standard, and 218 modern streamlined coaches produced by Canadian Car and Foundry, represent an expenditure of $59 million dollars—the largest order ever placed in one year by one road on the North American continent.

With these cars, which emphasize passenger comfort and convenience, Canadian National is modernizing all its main-line passenger trains from coast to coast. Their addition to the CNR system brings the number of passenger cars, built lighter, stronger and longer lasting with USS Cor-Ten Steel and owned by this road, to a total of 886—the largest number of Cor-Ten-built passenger car units operated by any single railroad.

The first Canadian National passenger cars built better with USS Cor-Ten Steel by Canadian Car and Foundry were put into service in 1938. This order consisted of 50 streamlined, air-conditioned coaches in which 26,300 pounds of dead weight were trimmed off the body structure of each car by careful design and by taking advantage of the high strength and high corrosion resistance of Cor-Ten Steel.

As a result of the excellent performance and economic advantages demonstrated by this original equipment, 377 additional units were added through the years, and "high strength steel construction" was specified by Canadian National when they placed the orders for the 359 cars delivered recently. We believe these facts speak for themselves.

* * *

Since 1934, some 6388 passenger cars built with USS Cor-Ten Steel have been put in service by 52 railroads in the United States and Canada.

The ability of this equipment to attract passenger traffic, and to keep operating and maintenance costs low are the potent reasons why this superior structural steel is so widely used today in equipment that ranks as the most modern, most efficient and most profitable on the rails. For not only does USS Cor-Ten Steel provide strength, stamina, and durability to a high degree but it lends itself readily to advanced fabricating techniques. In addition, and this is important, the cost of USS Cor-Ten Steel is comparatively low.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

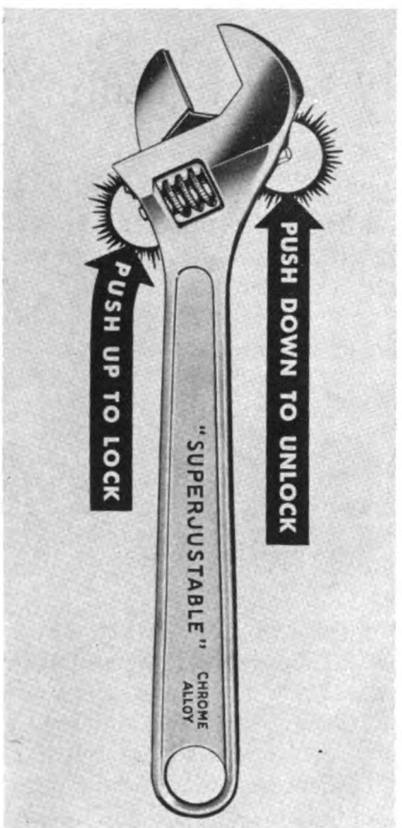
USS

UNITED STATES STEEL

(*Continued from page 24*)

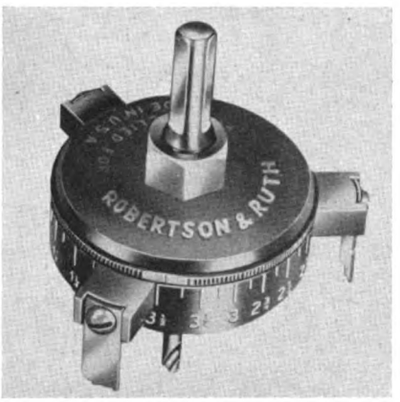
screw is also incorporated.

The apron is a one-piece casting with automatic lubrication. Longitudinal and cross feeds are engaged with drop levers operating positive jaw clutches. The bedways are ground, and will be flame-hardened on demand. A fully enclosed electrical panel provides a safe and accessible place for power connections. Power is transformed from 220 volts and over to provide only 110 volts at the operator's push buttons. The lathes are offered with a 5 or 7½ hp motor mounted on the rear of the headstock for easy maintenance. Tray-tops on the headstock and tailstock provide a parking place for mikes, tools, drawings, gages and other accessories. *Cincinnati Lathe & Tool Company, Cincinnati 9, Ohio.*



Self-Locking Wrench

The demand for a self-locking adjustable wrench has led to the development of the Superadjustable. The locking feature offers rapid adjustment, positive lock and adequate strength according to the manufacturer. The locking mechanism is small and does not result in a clumsy tool. A flick of the thumb or finger locks or unlocks the adjustment instantly in any position. The wrenches are drop-forged from alloy steel in 8-, 10- and 12-in. sizes with capacities up to 1 5/16-in. *J. H. Williams & Co., 400 Vulcan Street, Buffalo 7, N. Y.*

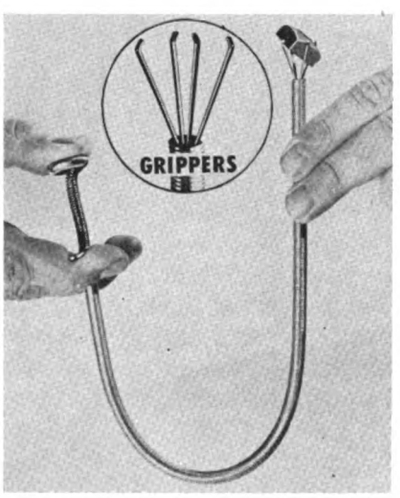


Dial Saw

The device will cut any size hole from 1-⅛ in. to 3-½ in. diameter in metals, wood, plastics, etc. Its three electronically heat-treated cutting blades adjust simultaneously to the size desired by adjusting the dial. This dial is calibrated in pipe and conduit sizes in addition to ⅛ in. segments.

Known as the Model 400, it can be used in tool rooms, model shops, wood and metal working shops, etc. The unit can also be used as a rotary planer, inlaying tool, or grooving tool; cutting any width groove from 1-⅛ in. up. It can be used with hand drills, both manual and electric, drill press, lathe and milling machine.

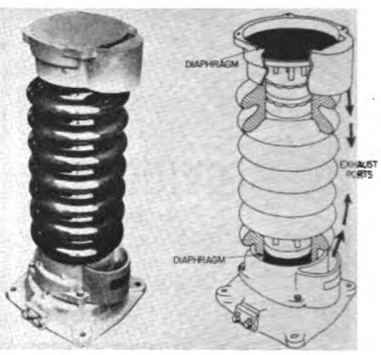
The saw comes complete with three sets of cutter blades—one set for metal, one for wood, and one for plastic. Cutting depth of the metal cutting blades is ⅜ in., the wood blades is 1 in. Replacement blades are available. *Robertson & Ruth, Box 534, Elmhurst, Ill.*



Retriever

Recovering small parts from hard-to-reach places is aided with the recently developed Proto Grab-All tool. It can retrieve and hold metallic or non-metallic objects and is flexible enough to reach around obstructions. When the cap at the top of the Grab-All tool is pressed, a cable that passes through the outer casing pushes four grippers out of the end. Expanding as they leave the casing, these spring steel grippers can grasp objects of varying sizes. A spring under the cap pulls the cable back into the casing until the grippers hold the object firmly.

Other uses for the Grab-All tool include holding small parts for assembly or for grinding when they are too small or too hot to be held in the hand. The tool is made in lengths of 12, 15, 18 and 24 in. *Plomb Tool Co., Los Angeles, Calif.*



Station-Type Lighting Arrester

The Type SV lightning arrester features a new safety pressure-relief device. Addition of exhaust parts on the arrester makes possible the removal of the source of gas-generation, should the arrester lose its ability to interrupt power flow. The arc is transferred to the outside of the porcelain housing within one-half cycle or less of fault current. This prevents rupture of the porcelain housing by arc-generated gases.

The station arrester is applicable on voltages from 3 to 330 kv. Maximum impulse sparkover values have been decreased for complete line to provide improved equipment protection. *Westinghouse Electric Corporation, Box 2099, Pittsburgh 30.*

Electrical Insulating Tape

"Scotch" brand electrical tape No. 39 features a pressure-sensitive adhesive that sticks tight on contact with 50 per cent more grab than its predecessor. Its adhesive forms a permanent, solvent-resistant bond after curing. The tape can be utilized in 90 per cent of the holding and insulating jobs in manufacturing and repairing electric motors, coils, transformers and generators.

Shelf life of the tape has been improved considerably while oven cure time remains

(*Continued on page 106*)

EDITORIALS

Are Lighter Faster Trains Feasible?

Not many railroad men realize that a single diesel freight unit can pull a bigger train at 20 mph than four units of the same horsepower can pull at 60 mph or that the one unit can pull at about 30 mph as much as four like it can pull at 60 mph. Nor do many appreciate that this is but one of three disadvantages of running shorter, faster freight trains. The other two disadvantages are that fuel consumption would rise substantially and that a considerably larger fleet of locomotive units would be required to handle a given volume of business.

Now just why are the above statements true and just why should these points be of anything more than merely academic interest to the mechanical maintenance man?

The effect of running shorter but faster freight trains can be approximated by comparing the average fuel cost of freight-train operation with that of passenger-train operation. Such a comparison will show that the fuel cost for passenger operation is approximately twice that of freight operation on a gross-ton-mile basis. Therefore, if the freight train were to dwindle in size and increase in speed, the fuel cost would approach that of the passenger train to the same degree that the size and speed of the freight train approached that of the passenger train.

The second penalty to be paid for running lighter, faster freight trains would be the additional units that would be required to handle a given volume of business. Again the passenger service can be used as a good yardstick to project the effect of shortening and speeding up the freight operation. Statistics show that the gross ton miles per hour produced by the average passenger train is somewhat less than half that produced by the average freight train. It is only logical to expect, therefore, that the gross ton miles per hour produced by freight trains would be reduced in the same proportion that their size and speed approached that of passenger trains. The net result of this would be that more units would be required to handle a given volume of business.

Just what does this mean to the mechanical maintenance man? It is certainly a strong indication that speed alone is not the full answer to the problem of the railroads' declining share of the freight business. There may be other and cheaper ways to accomplish the same results. For example, a reduction of 15 to 20 min in predeparture inspection time can be equal to a higher top speed of nearly 10 mph for the next hundred miles. But where the higher speed will entail higher operating costs and perhaps necessitate an extra diesel unit on the head end, the faster inspection may be attained at no extra cost.

On the other hand, it is conceivable that faster overall movement on the average may be attained by lengthening, rather than shortening, inspection time. How many times could a hot box and its hour or so delay have been prevented by a few more minutes at the terminal? Sticking brakes that could have been remedied by a few more minutes at the terminal but which end up causing a break-in-two—how often do they occasion several hours delay to the train affected and to other trains on the line?

Perhaps the most revealing conclusion that can be drawn is how much it costs to make up the time lost by road failures or to compensate for added inspection time. The increased speed necessary is not cheap. It may be a good deal cheaper to attain the same end by generally higher standards of maintenance or by a number of other things within the realm of the mechanical man's ingenuity, ranging from faster and better inspection procedures on through improved organization and work methods and possibly more efficient facilities.

Life of a Diesel

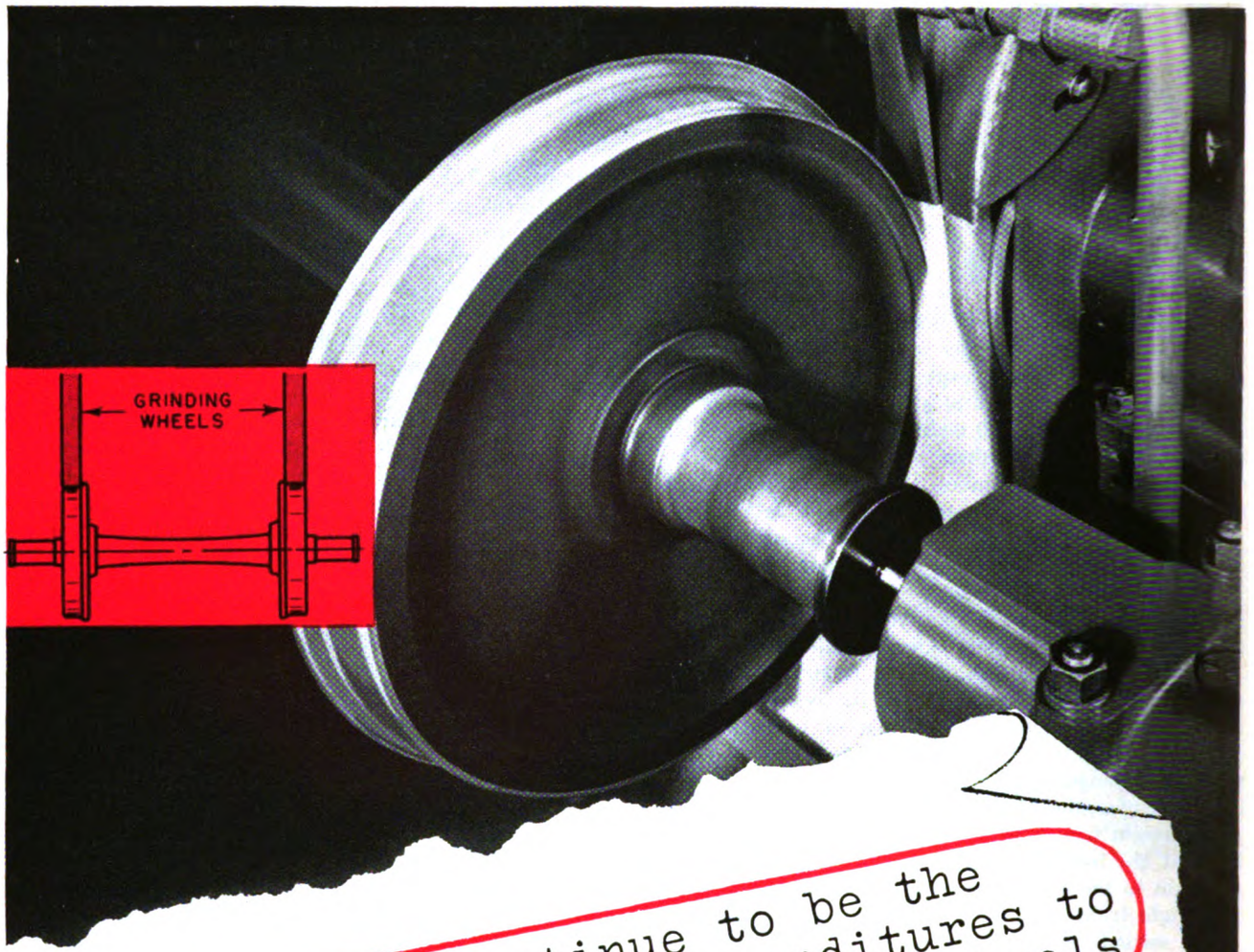
What is the economic life of a diesel-electric locomotive? When the head of the mechanical department of one railroad was asked this question, he said, without equivocation, "Fifteen years." A second, on another railroad, asked the same question, said, with equal assurance, "Thirty years."

Why the difference? The basic thinking of these two men is essentially similar. Both agree that any locomotive can be maintained in nearly its original condition as long as it is practicable to do so. They both also hold to the premise that single maintenance items, or overhaul costs be held to limits which will avoid their being added to capital account. In this they are not in agreement with those who believe in the complete rebuilding of locomotives which may be from 8 to 12 years old. This is based on the assumption that improvements in components will justify this procedure.

Differences in the thinking of the two men were derived from two different concepts. The first believes that parts maintenance should be continued until major overhaul of the locomotive chassis becomes necessary. The second maintains that the body and frame of a locomotive may be continued on a parts replacement basis, as long as economics warrant.

The second difference in the thinking of the two men is brought about by differences of opinion on progress of design. One thinks that locomotives built today will be made obsolete by new designs produced 15 years from now. The other thinks the locomotives purchased now can economically be kept in competition with new designs for a period of 30 years.

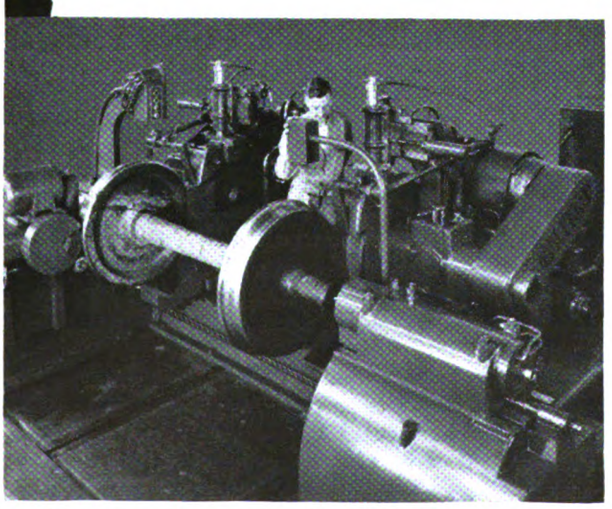
It is possible that within the limits of their type of operation and maintenance procedure, both men may be right. But a two-to-one ratio is a wide one. If opinions did not vary over so wide a range, purchasers of new locomotives as additions or replacements could look to the future with increased confidence.



"Wheel shops continue to be the object of extensive expenditures to obtain more accurate work on wheels and axles."

Quotation from Railway Age Outlook Letter

FILMATIC



CINCINNATI FILMATIC Car Wheel Grinding Machine

To meet output requirements and improve quality, Cincinnati Grinders Incorporated developed this car wheel grinder. It simultaneously grinds two wheels to the close accuracy demanded by today's improved service . . . roundness within .001" and concentricity with journal diameters within .003". Diameters ranging from 20" to 45" can be ground on these machines. ¶ You can expect long productive life and negligible maintenance when you install CINCINNATI FILMATIC Car Wheel Grinders because the grinding wheel spindles are mounted on FILMATIC bearings. This construction requires no adjustment, no attention whatever except lubrication. You may obtain complete details by writing for Cincinnati's "Report" magazine, Vol. 9, No. 4.

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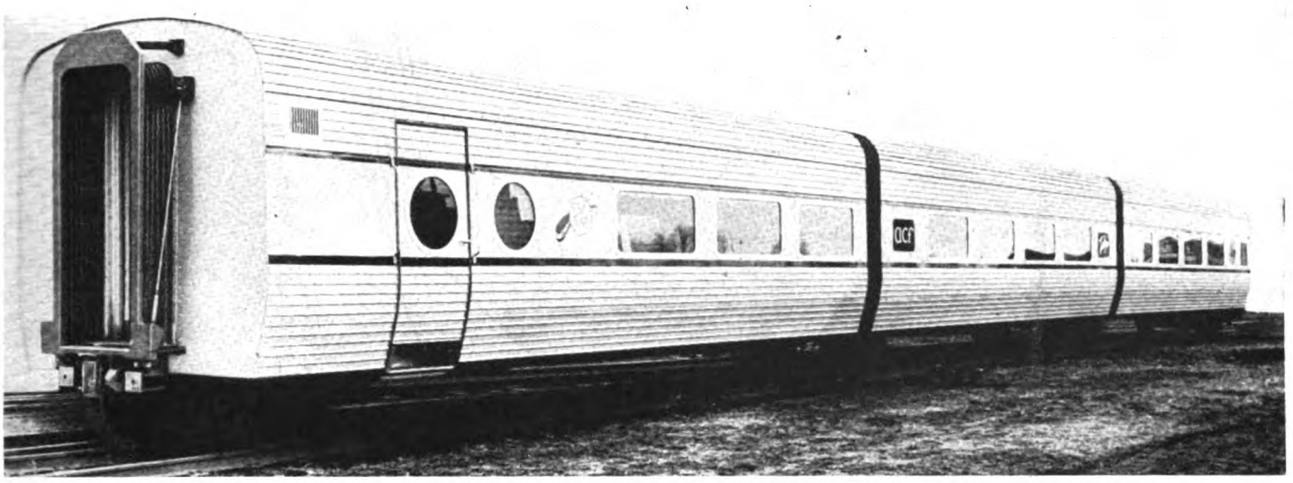


With the exception of head-end power, the three-unit 1955 Talgo coach is an independent unit. It can be handled and switched like conventional passenger equipment.

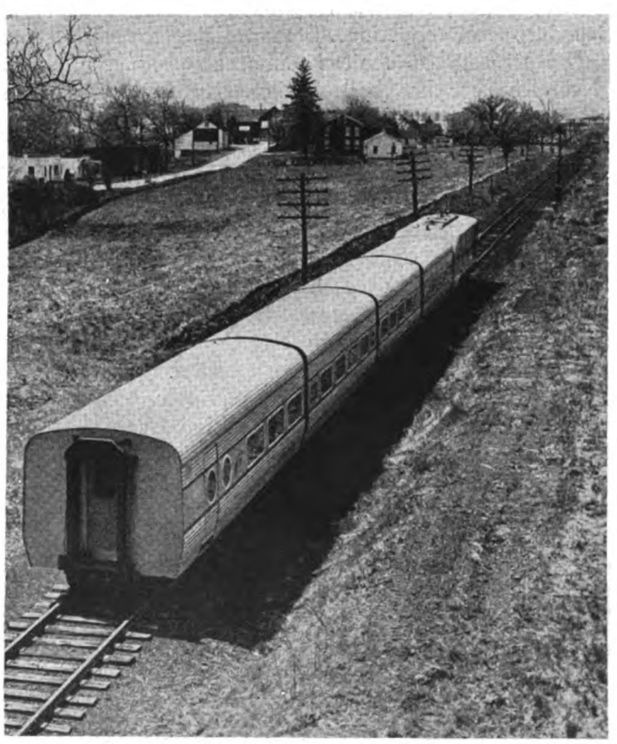
US Talgos Will Have Three-Unit Cars

American requirements and Spanish experience result in new Talgo design; ACF produces first coach.

American railroad requirements have led to the production of the first three-unit articulated Talgo-type coach by ACF Industries, Inc. Late this year four of these cars will be delivered to the Rock Island for the Chicago-Peoria "Jet Rocket." Next year the New Haven will receive others of the same type for their New York-Boston Talgo train. The ACF coach has undergone running tests near the builder's plant at Berwick, Pa. While the two trains are being built, this car will be making demonstration runs with the locomotive from the original Talgo demonstrator train.

Two Talgos went into regular service in Spain over five years ago. Studies by RENFE, the Spanish national railways, have revealed that a saving of over 60 per cent would be brought about by using Talgo equipment for all their train services. The two Talgos have been in daily operation between Madrid and the French border over mountainous country with grades in excess of two per cent and altitudes from sea level to 4,500 ft. The previous 12-hr trip is made by the Talgos in 8 hr. Service has never been interrupted by mechanical failure.

The two trains delivered to Spain are composed of multiples of five units and are completely articulated. Two coach units are placed at each end of an equipment unit. The equipment unit contains toilets, storage space, and the airconditioning equipment. Power and water come from the locomotive. This five-unit assembly is called a coach, but is not a separate vehicle which can be readily cut out of the train.



Broad as it is high, the 1955 Talgo is shown during tests near Berwick. The three-unit coach is separated from the original Talgo locomotive by one coach unit ACF is using for test purposes.

Three units make up the 109-ft length of this coach. The intermediate partitions are over the connections that retain the full articulated principle used on the original Talgo trains.

In the new train, articulation is used only between the three units of each car but not at its ends. The front of the lead unit of each coach has its own wheels rather than resting on the rear of the unit ahead. At both ends of the three-unit car are tightlock couplers, curtain diaphragms, and air-brake and electrical connections. Coupling such cars into a Talgo train will be much the same as coupling conventional equipment. Not only is switching made easier, but cars of the new design will operate in either direction. This will make Talgo adaptable to many applications where turning the train is difficult.

The three-unit Talgo car has been designed to accommodate all interior arrangements. While the present car is a coach, the space can be used for parlor, dining or sleeping accommodations. Standardizing the basic structure is expected to achieve some mass-production economies. The car has been designed to fit all American clearance requirements. Its extra width is possible because the short unit length causes less overhang on curves.

The 800,000-lb buffing load and other RMS and AAR standards are met by the units. The underframe, side and roof are prefabricated and assembled into an integrated, tube-like, stressed-skin structure. Low-alloy high-tensile steel can be used throughout. A low-alloy frame with aluminum-alloy superstructure or stainless-steel sheathing are other possibilities.

The tightlock couplers have a center height of only 19 in. The builder has suggested equipping conventional switching locomotives with an additional coupler below the present one, or using an auxiliary coupler slipped over the Talgo coupler. Brakes on the new coach are completely pneumatic. The hydraulic circuits used in the brakes of the original Talgo have been eliminated. However, the automotive type of internal expanding brake is retained. The Spanish service has shown that these brakes have a shoe life in excess of 500,000 miles. The three-unit car has its own water supply.

The new Talgo coach depends on a trainlined head-end source for 440-volt, 3-phase, a-c power. Maximum electrical requirements for each car will be about 40 kw. This load is high because, in addition to lighting and air conditioning, the car has complete electric heating. The car is equipped with batteries and a trickle charger to allow greater flexibility and for emergencies.

An electro-mechanical freon air conditioning package is installed at each end of the three-unit car. Each package is rated at five tons. Installation at the car ends permits easy access and replacement for maintenance and overhauling. Heating is accomplished with electric-strip heaters in the air duct system and in the floor.

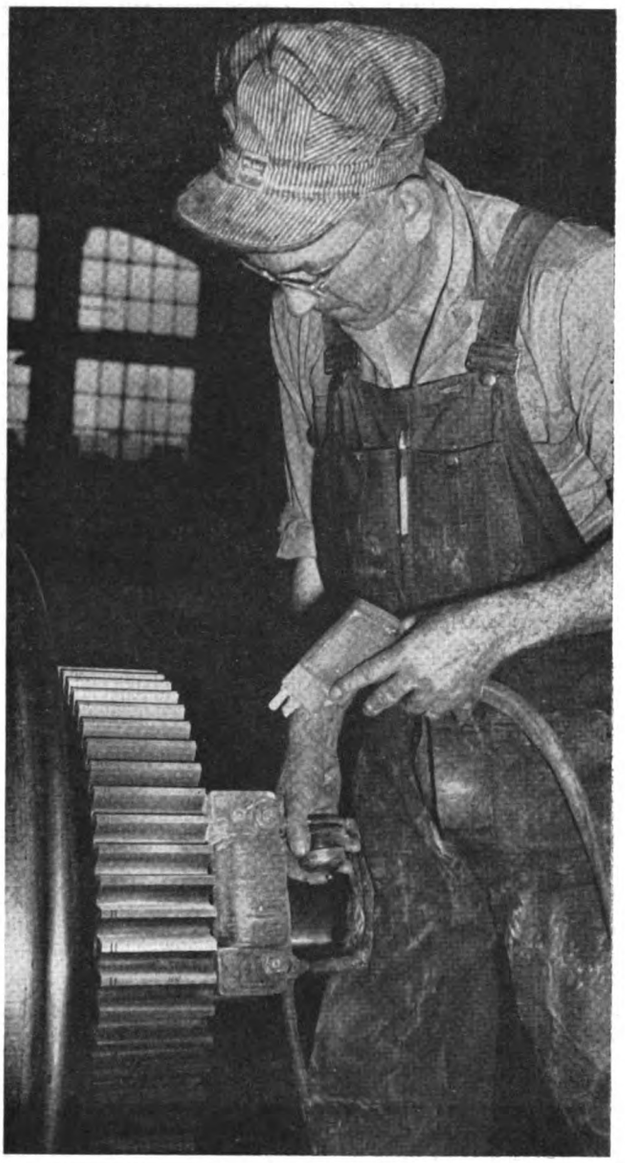
The basic car seats 84 passengers with seats spaced on 42-in. centers. With seat center distance reduced to 36-in., the capacity becomes 96. ACF has developed a Hi-Lo door which permits passengers to enter the car from high-level platforms or from track level. This feature is optional and would only be supplied for lines requiring it. Because of the flexible and reversible car now developed, ACF believes that the cars can be used in train service with a locomotive at the front end only, or in motor-train service with locomotives at both ends. The motor train would require locomotive control circuits to be trainlined through the cars.

Trains of three-unit Talgo cars can be powered with existing locomotives if the railroad does not have excessive curvature or too fast a schedule. Special low lightweight locomotives are necessary to take full advantage of the Talgo design. Plans for special locomotives will include generators for the a-c train line. If conventional locomotives are used, a power car would supply the a-c power and provide the transition between coupler heights.

COMPARISON OF CARS

	Articulated 1955 Talgo	*Articulated 1949 Talgo*	*Conventional 1954 Coach*
Unit Length, ft-in	34-6½	20-2	85-4½
Total Height, ft-in	10-10	9-7	13-6
Total Width, ft-in	10-2	10-7½	9-11
Rail to Floor, ft-in	2-4	1-6	4-3
Coach:			
Number of Units	3	5	1
Seating Capacity	84	64	80
Total Weight, lb	65-80,000	37,400	131,000
Total Length, ft-in	109-3	101-0	85-4½
Coupler Height, ft-in	1-7	None	2-10½

Magnetic particle inspection of wheels with rectangular-shaped formed coil, 110-volt a.c. design



Magnetic particle inspection of axle gear with magnetic yoke, 110-volt a.c. design

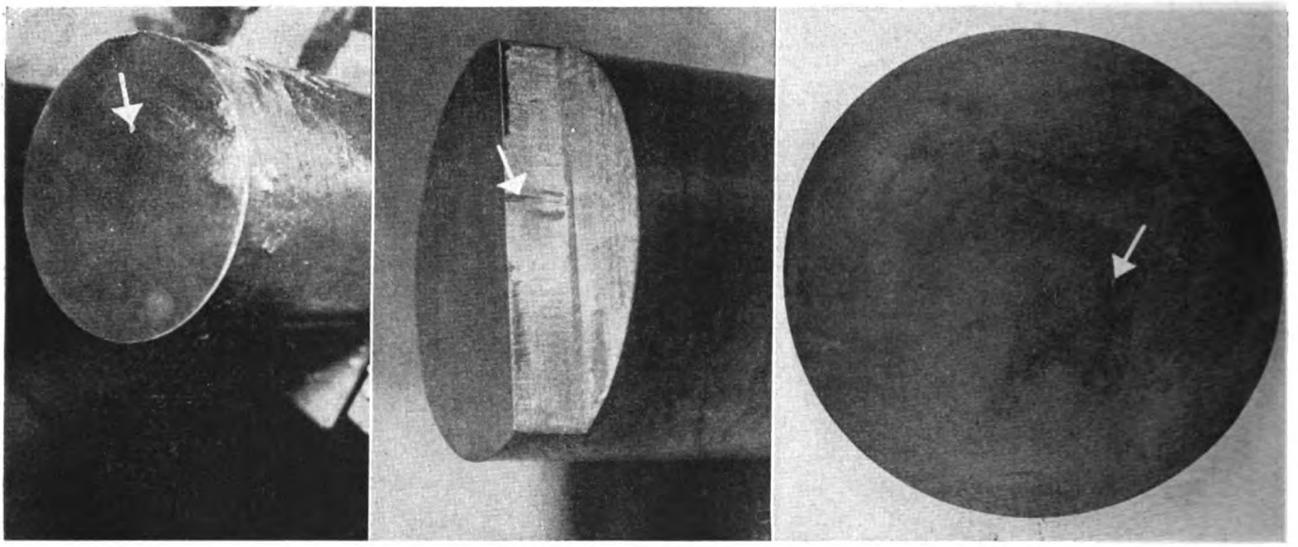
How the Southern Pacific Uses

Non-Destructive Testing . . .

To promote safety, improve inspection, give quality control of materials and reduce overall costs

What is a "pip?" And what bearing, if any, does it have on railroad operation? In railroad parlance, a pip is *not* a chicken's disease, a small seed, or even an expression of admiration. It is an ultrasonic indication in reflected wave form of a defect, such as a non-metallic inclusion in steel, and test engineers and other researchers are now trying to relate the height of the pip to the size of the defect. This and numerous other important matters relating to non-destructive testing were covered in a paper by Arthur S. Pedrick, assistant engineer of research and mechanical standards, Southern Pacific, at the recent Los Angeles meeting of the Society for Non-Destructive Testing, Inc.

Periodic inspection, maintenance and tests are of paramount importance in railroading since safety of operation must be assured at all times. Safety First is usually associated directly with train operation, but successful train operation also depends on quality control of materials and parts used on rolling stock as well as proper



Reflectoscope picks up large flaw (left arrow) which is silicate inclusion about 9 in. from axle end—(Center) Notched axle shows flaw (arrow) extending parallel to the longitudinal axis—(Right) Acid-etched section of axle about 6 in. from one end showing same inclusion reduced in size and other flaws due to poor steel structure

maintenance of this equipment and track, roadbed and related facilities so that all will serve their intended function with the desired reliability and safety in service.

Quality control of materials and inspection of parts in connection with maintenance and shopping of railroad equipment entails a large number of test methods, many of which are highly specialized non-destructive type, and this work on the Southern Pacific is directed by the Research and Mechanical Standards Department.

Some of these test methods are more applicable to railroad work than others. For many years it was common practice to use oil and whiting methods for detecting flaws. In 1939 magnetic particle inspection was brought to the attention of the railroads by the Magnaflux Corporation. This test proved effective in locating fatigue cracks in locomotive side rods, valve motion work, crankpins, axles, piston rods and other important parts of railroad equipment. Fatigue cracks develop at right angles to longitudinal axis of such parts so a longitudinal magnetic field is required. The usual test consists of wrapping three turns of flexible cable around the part and energizing with 500 amp. at about 6 volts. Magnaflux powder is sprinkled on as the coil is moved along the part.

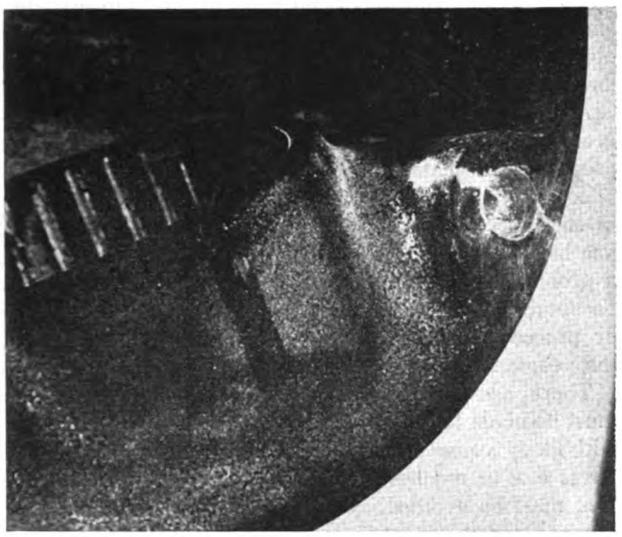
The importance of magnetic particle inspection was soon recognized by the Association of American Railroads and made a mandatory requirement for testing all dismounted car axles used in interchange. This was extended to include the journal portion of mounted axles whenever they are machined. The most recent mandatory requirement in the AAR Wheel & Axle Manual calls for removal of drive pulleys each time mounted wheel assemblies go through the shop for conditioning of wheel treads, so the body of the axle under the pulley mounting can be tested for corrosion fatigue-type defects.

As the use of diesel locomotives increased, there was need for other special kinds of inspection. For example, valves from diesel engines are made of an alloy steel which is relatively non-magnetic due to high percentage of chromium and nickel. Values will not take a satisfactory magnetic test, so other methods such as the Zyglo fluorescent-penetrant-type of non-destructive test has been applied to this problem. Zyglo inspection is set up for inspection of valves at all major points on the SP where diesel maintenance is performed. Its prime purpose is to check used valves at the time of engine overhaul to be sure that these important parts are free from heat checks or any defects which would impair their normal service life. Recently it was found necessary to extend this to 100% inspection of new valves. In December 1954, 1,500 new valves were inspected at the Sacramento Shops and a total of 97, or 6½ per cent rejected. All defect indications in the head portion of valves are cause for rejection except the circular mark which appears near the center of head on some valves and is caused by the forging-hammer operation. The lower end of the valve stem is also checked closely and valves which show defect indications, either longitudinal or transverse, below ½ in. from the upper keeper groove are not used. Longitudinal seams up to one inch in length and located more than ½ in. above the upper keeper groove are not considered injurious to the service life of valves. This inspection will be continued until such time as the desired quality of product is supplied by manufacturers.

Many diesel engine parts are made of ferrous materials and can be tested to best advantage with Magnaglo magnetic-particle inspection. Connecting rods, fork-rod baskets, drawbar pins and similar parts require a longitudinal magnetic field applied continuously with strength about 2,000 to 2,400 ampere-turns. Piston carriers, wrist pins and bearing rollers require a circular field as produced by passing current through the part, or through a heavy bar of copper or brass when the bar can be placed through a hole or opening in the part. Diesel pistons are subject to fatigue flaws at several locations and directions so that both longitudinal and circular magnetic fields must be used to assure complete inspection for all possible defects.

Detecting Internal Flaws

The tests mentioned thus far are essentially for surface crack detection and examination. For detecting internal flaws, radiography with X-rays and with gamma-



Flaw in diesel engine piston carrier discovered by Magnaglo inspection

rays is used, also sonic methods and ultrasonic methods as well as electrical and magnetic field tests which have been applied by means of inspection cars for checking railroad rails.

The SP purchased one of the Sperry Model SR05 ultrasonic reflectoscopes in 1949. This was one of the first ultrasonic reflectoscopes on the Pacific Coast. It has served well for testing the driving axles of steam locomotives and to a more limited extent, crankpins. A frequency of 2¼ megacycles has been found satisfactory for this work.

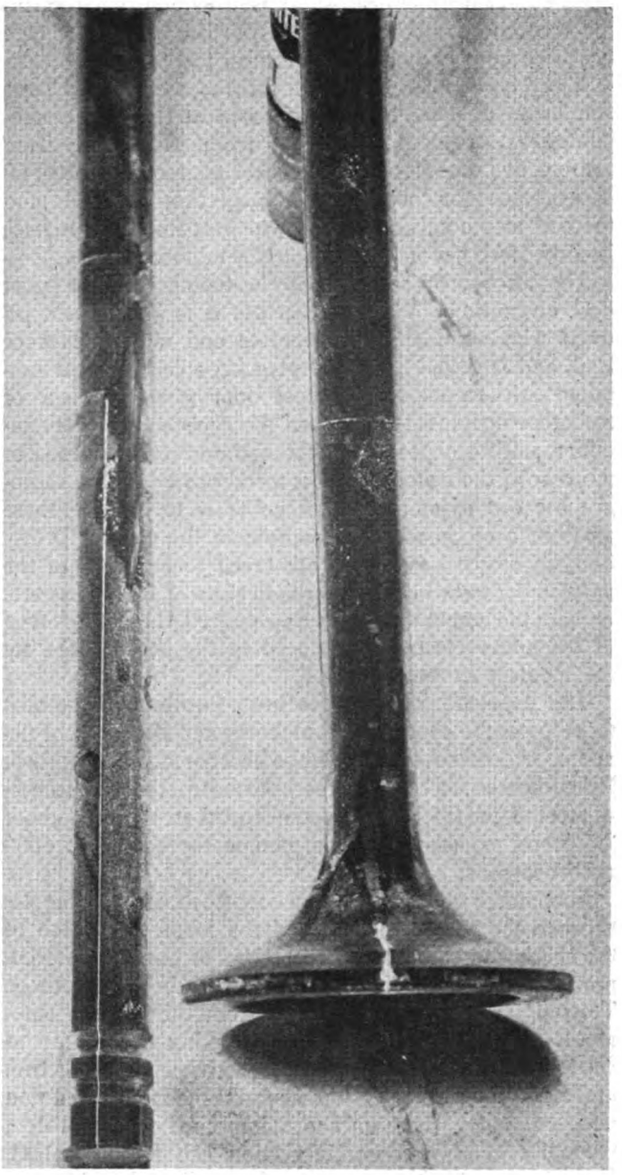
Driving axles are subject to fatigue cracks at the journal fillet near the wheel fit and also just inside the wheel fit where the flaws will not be visible by other tests except by dismounting the wheels from the axles. Crankpins develop fatigue cracks at the point of highest stress which is the fillet area at the edge of the press fit in the wheel hub.

The SP has also applied the reflectoscope to the inspection of diesel locomotive axles. By testing diametrically through the axle, using contact methods and heavy oil as the coupling medium, ultrasonic indications have been found in a high percentage of the axles tested. Many of these indications are near the center of the axle so they are located at or near the neutral axis with respect to stress, in which case they may not be injurious to normal service life of the axles. These indications are usually due to non-metallic inclusions in the steel at the time of manufacture.

There is a problem of interpreting the indications, giving due consideration to their size, direction and location with respect to the highly stressed portions of the axle.

A diesel locomotive driving axle was sectioned through locations where several flaws were indicated by the reflectoscope in order that ultrasonic indications could be correlated with actual physical findings.

By physical examination, as has been shown, the inclusion was found to be at least twelve inches long. However, inclusions of this type are inherent in this grade of steel. Known as secondary piping, they can only be eliminated by using a much better grade of steel for axle fabrication. Although such conditions are not desirable, it is interesting to note that this particular axle



Flaws in diesel valves shown up by Zyglo inspection

had been in service for a period of 13 years. It was still in serviceable condition with no evidence of fatigue so it appears that the strength of the axle was adequate to meet service requirements. It will be necessary to correlate actual service performance with axle steel quality. Further study of these conditions will be required and ultrasonic inspection can be used to good advantage on this problem.

Ultrasonic inspection is also being applied to some extent to the problem of shattered rims which sometimes occur in diesel locomotive wheels. This condition is usually caused by laminations or inclusions during the manufacturing process. The wheel manufacturers are trying ultrasonic inspection methods to detect any internal conditions which might cause wheel failure.

Other Non-Destructive Tests

Other kinds of non-destructive tests have been developed to meet specific problems on the railroads. The Sperry Rail Detector service is a typical example. The

Sperry reflectoscope also works well as additional means for inspecting rail. On the SP, the Branson Audiogage has been applied successfully to rail inspection.

X-ray type inspection has a definite usefulness. Tests similar to this are being performed at the Sacramento laboratory, using gamma rays from radium or from radio-active Cobalt-60. A 5-curie source of Cobalt-60 is available for radiographic inspection purposes and there is also a smaller source which at time of purchase in July 1951 had a strength of 620 millicuries.

The SP 5-curie source must be handled with a good deal of caution. When not in use it is stored in a pit lined with six inches of concrete and eight inches of lead, and is sealed by a lead plug. A spherical lead container with a six-step conical door gives a beam of radiation in limited area when the capsule is in the container and no exposure to the operator if he remains to the rear of the container. The usual procedure for radiographic test of couplers and yokes is to arrange these parts in a circle with the capsule in the center. X-ray films in cassette envelopes are taped to the back of the parts under test. Lead foil on both sides of film in cassette reduces the amount of exposure required, due to the effect of secondary electrons produced in the lead screens by the incident gamma rays.

The exposure required varies according to the distance from the capsule and thickness and character of the metal. A greater distance gives sharper outline of blowholes, cavities, etc., but increases exposure time. A section of steel, 1 in. thick, at a distance of 6 ft. requires about 2.5 hours exposure, using a gamma ray source of 6000 milliroentgens.

Sometimes two exposures are made at different angles through the part in order to give a better indication of the shape and character of inclusions of foreign material, porosity, blowholes or shrinkage cavities in steel castings. Tests of representative samples from the various shipments are usually sufficient for checking the quality of castings and similar materials. Experience at the SP iron and brass foundries at Sacramento has demonstrated that where foundry techniques are improved to establish a normally good product, inspection can be minimized. Experience with the product of suppliers has likewise indicated that rigorous rejection of faulty material has forced modification of manufacturing techniques and assure a much more satisfactory product.

Black Light Checks Fuel Leaks

A new test, helpful to the railroads, is the application of high intensity black light to the problem of finding fuel leaks in diesel engines. Most of the railroad diesel engines have a crankcase capacity of approximately 200 gal. of lubricating oil. Fuel oil leakage into the lubricating oil is one of the most common causes for crankcase oil changes. The SP allows from 3 to 5 per cent fuel oil dilution depending on the equipment and type of service. The amount of dilution is indicated by viscosity tests at central control laboratories, but the finding of small leaks or mere seepage of fuel from joints and pipe connections in the engine becomes a difficult problem.

This form of non-destructive test takes advantage of the fluorescent characteristics of fuel oils and lubricating oils. When exposed to black light, lubricating oil appears as an opaque "milky-white" color, while fuel oil has a "milky-purple" color. Fuel leaks can then be located by shining high intensity black light on the fuel injectors and fuel oil lines, at the same time having fuel pump in operation so that normal pressure will be present and looking for areas showing purple color.

A useful non-destructive test will provide reliable measurements or indications that can be correlated with properties of materials or discontinuities which would affect the serviceability of materials, parts, structures or assemblies. Assuming the most effective form of test has been selected for requirements at hand, there is still a problem of training operators so that best results will be obtained with these special tests. Any testing device or procedure is only as good as the understanding of the people who use it.

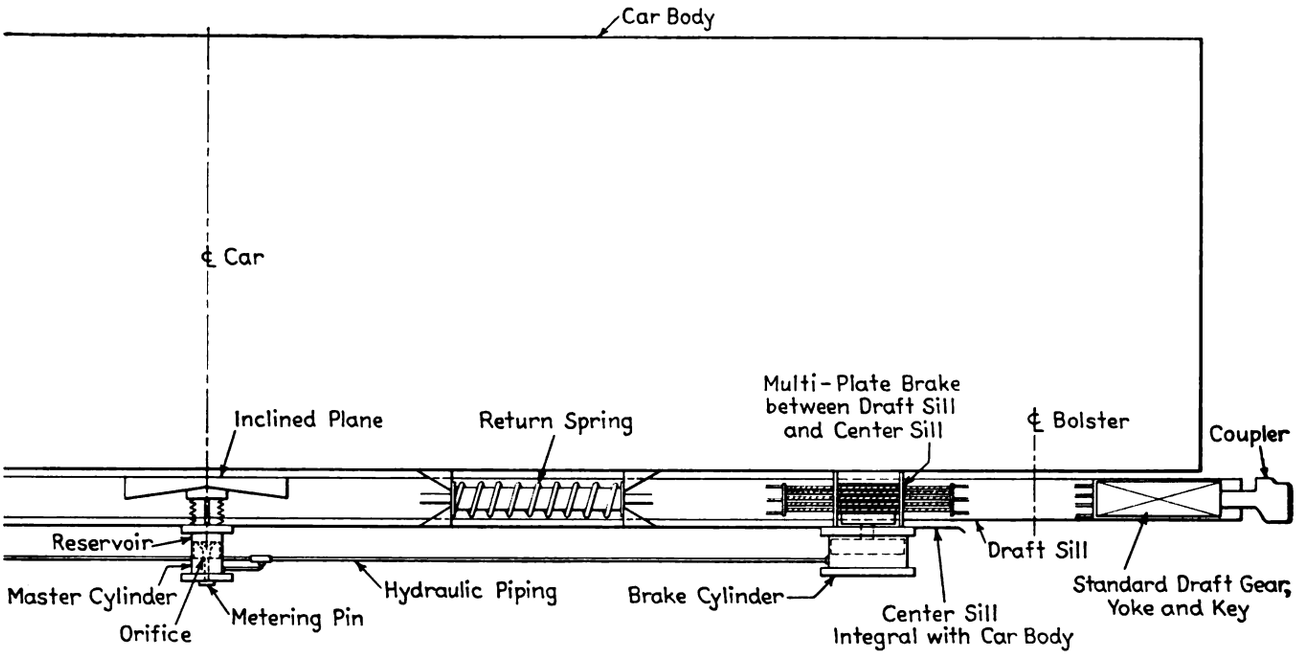
There are many types of flaws, and interpretation must be made to distinguish those which are harmful and will likely cause failure in service. Concentration of stress due to notches, change in section, fatigue cracks, etc., must be avoided. On the other hand, it should be remembered that parts are manufactured to a functional quality. The improved inspection methods now available are capable of showing indications of discontinuities in practically all parts. The cost of parts would be prohibitive if they were manufactured solely to standards of appearance rather than to serve the purpose intended.

The operator, therefore, must have a thorough understanding of the potentials of cracks in parts and whether their direction is relevant to lines of major stress or whether the checks are merely small seams from machining, which are not so oriented as to cause nuclei for eventual failure. Thus, not only an understanding of the practical use of the test is required, but an understanding of the nature of stresses and stress concentrations if inspection is to be of maximum value to the railroad.

Many new, modern test instruments are finding applications in railroad test work. The electron microscope is proving useful in checking stability characteristics of diesel fuel oil and effectiveness of additives in fuel oil and in lubricating oil. Spectrographs and quantometers have also become quite common in railroad laboratories. The SP has two ARL spectrographs. One is in general use at the Sacramento laboratory for foundry controls and miscellaneous testing of unknowns. The other instrument at the SP Los Angeles branch laboratory is used for checking trace elements in diesel crankcase oil.

The SP has been working on a number of research projects; some of them in cooperation with the Stanford Research Institute. These projects include improved sanding of diesel locomotives, hydro-friction draft gear for freight cars and use of cheaper types of fuel in diesel locomotives. These test projects are in addition to the usual work at SP laboratories in connection with problems of maintenance and control of purchased materials.

With further reference to applying non-destructive tests to railroad maintenance, it should be realized that each type of test will reveal only the specific kinds of defects or discontinuities for which it is designed or best adapted to reveal. It will not be a cure-all to overcome lack of knowledge as to reason for service failures and specific nature of materials or prevent early fatigue on account of poor design or improper manufacturing practice. The proper use of non-destructive tests can, however, give additional factual data which are helpful from the standpoint of engineering and design.



How Hydrafriction Cushioning Device Works

The new hydrafriction freight-car cushioning device, now being developed by the Southern Pacific in conjunction with the Stanford Research Institute, utilizes hydraulic control of a friction mechanism which absorbs energy in proportion to the load and speed of impact. Patent applications are pending on the new construction which requires an underframe of special design and hence is limited to use in new cars.

The SP 50-ft. box car, built at Sacramento shops and equipped with the pilot model of this device, including a conventional draft gear in each end of the floating center sill, has been tested in road service and safely cushioned shocks at impact speeds up to 10 mph. This test car has been released to service on SP lines and its performance is being closely watched. The current problem is how to simplify the system and make it economically feasible for wider application.

Since the practicability of the device must be demonstrated by further experimental use and development under widely-different operating conditions, no statement can yet be made about plans for the manufacture, sale or licensing of this device for general use.

Referring to the schematic drawing, the car sill, which carries the pull of the train from one coupler to the other, is separated from the car body by sets of plates that slide over one another. Half of these interlocked plates slide with the car sill and the other half are restricted against the car body. The harder these plates are squeezed together the greater the sliding friction between them and consequently the more energy they will absorb.

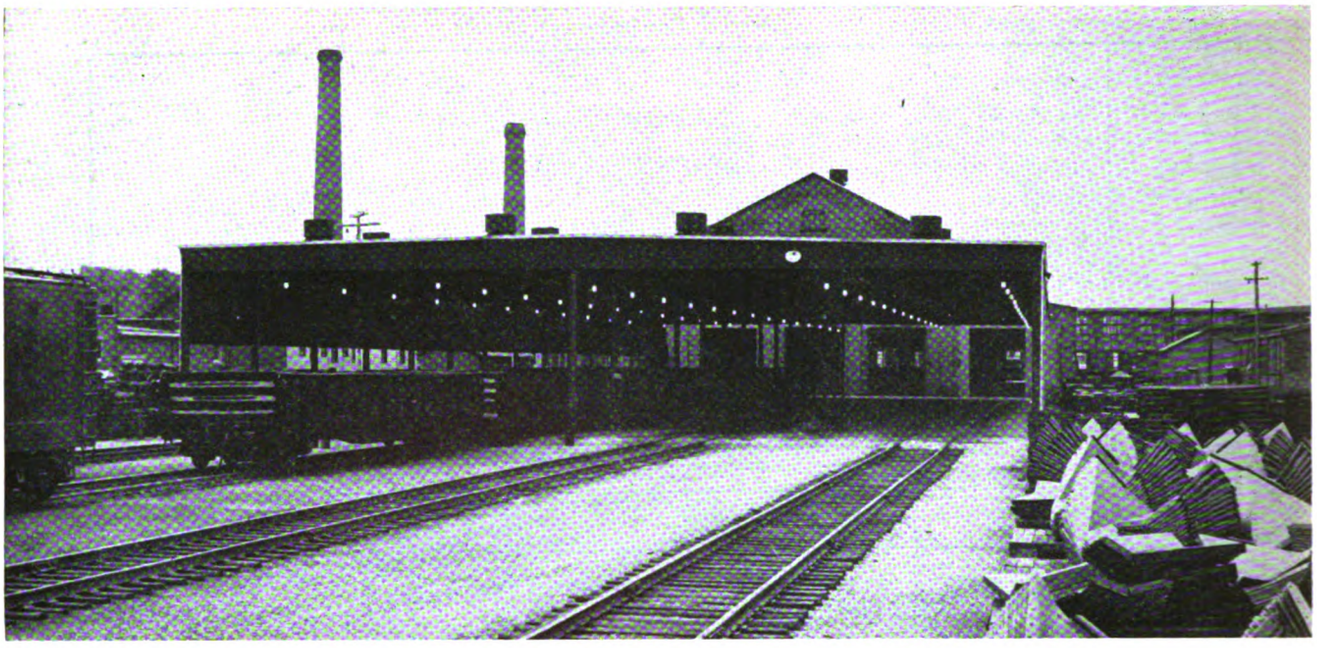
The amount of this pressure must be varied according to the speed of impact and weights of the cars and their loads. The hydraulic system does this. A cylinder containing oil is connected bettween the car body and sliding sill by means of an inclined plane and crosshead assembly. It generates an oil pressure proportionate to the movement of the sliding sill by use of a so-called metering pin. This oil pressure is transferred to an hydraulic ram acting on the stack of friction plates so that the greater the impact the greater the hydraulic pressure and the tighter the plates are squeezed together.

In operation, upon coupler impact, the conventional draft gear and draft sill are displaced simultaneously with respect to the car body. As the draft sill is moved by impact, the inclined plane, which is attached to the draft sill, is moved, pushing the piston in the master cylinder down.

The displaced hydraulic fluid at the bottom of the master cylinder escapes up to the reservoir through an orifice in the bottom of the piston. The metering pin projects through the orifice and governs the pressure transmitted by the hydraulic piping to the brake cylinders. By varying the diameter of the metering pin throughout its length, braking pressures are varied depending upon the stroke of the master cylinder piston.

The two multi-plate brakes consist of long plates attached to the draft sill which slide at impact between short plates attached to the car body. When hydraulic pressure is transmitted to the brake cylinder the piston is pushed upward compressing the stack of brake plates, as stated, and causing friction which resists movement of the draft sill.

After the draft sill movement has been stopped by the multi-plate brakes, the return springs, which were compressed by the draft sill movement return the draft sill to its neutral position. This sequence of events is instantaneous and occurs when the car is impacted at either end.



Rebuilt cars move from the erecting shop through this four-track paint shop. Car repair material is stocked close to shop buildings, can be quickly reached.

Cars Repaired in Ex-Steam Shop

Baltimore & Ohio tools heavy car repair production line using abandoned locomotive shop

Weather no longer affects the car repair programs at the DuBois shops of the Baltimore & Ohio. Since July, 1954, all car repairs made there have been done under roof. Much of this protection is provided by buildings of the former locomotive shop. These buildings have been converted so that a production line can be established for heavy freight car repairs. Lighter car repairs are now made through the same shop.

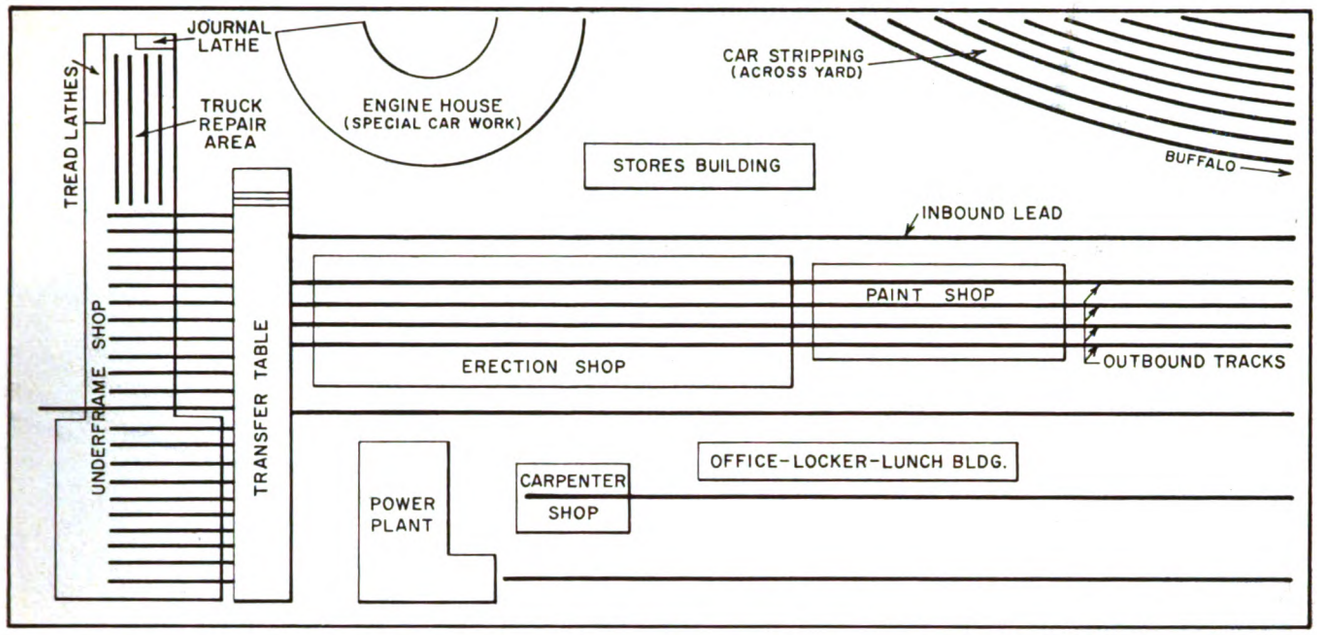
Dieselization on the Buffalo division and other parts of the B & O brought an end to steam locomotive repairs at DuBois, Pa. This installation was formerly the locomotive shop of the Buffalo, Rochester & Pittsburgh. After the B R & P was absorbed in 1932, the B & O continued to do locomotive work there. With the completion of repairs on an eight-wheel switcher in May, 1953, the shop was closed.

Car repair work of the B R & P was also done at DuBois in a shop located at Brady street on the other side of town. The B & O has continued to operate this shop and gradually employment went from 200 to 500. Box cars, cabooses and work cars have always been repaired inside the shop building. Hoppers, flats and gondolas formerly were worked on adjacent outside tracks and frequently these repairs were curtailed by bad weather. Today Brady street shop works only on box cars and non-revenue equipment. The repair of gondolas, hopper and flat cars was moved to the rebuilt locomotive shop July 1, 1954. Work at both shops now proceeds under less crowded conditions.

The locomotive shop included a 30-track transverse type boiler and tank shop serviced by a transfer table. At right angles to the tank shop, and on the opposite side of the transfer table was a three-track longitudinal style erecting shop. This building is 524 ft long, and formerly had machine bays down both sides. This building and the tank shop were equipped with a number of overhead cranes. A carpenter shop, power plant, locker building enginehouse and stores facilities are close by. All these facilities have a role in the new scheme which now turns out rebuilt cars rather than locomotives.

In production-line car repair, the cars delivered to the inbound lead will be stripped ready for rebuilding. This work is done on the far side of the main tracks and the yard in a car department operation otherwise devoted to scrapping cars and locomotives. The original transfer table was too short to handle mill gondolas and during reconstruction the table and pit were extended so that 65-ft cars can be accommodated. Shop cars switched to the inbound lead are moved over the transfer table, and into the shops with two tractors operated by car shop men.

The former boiler and tank building is now known as the underframe shop. Shopped cars are first brought into this building. As overhead cranes lift them from the trucks, car bodies are blocked up for underframe work. The cranes then move the trucks to the truck repair area. Trucks are torn down, inspected, and rebuilt. Repairs to the underframe, center plates, draft assemblies and train line are made while the body is blocked up. Rebuilt trucks are placed under the car and a tractor moves it across the transfer table and into the erecting shop for body work.



Car shop uses the former DuBois locomotive shop buildings. With the addition of a new paint shop, B&O has established a production-line car repair operation.

The underframe shop has a capacity of 31 cars. While steam locomotive repairs were being made, the 10 stalls at the east end of the building were extended toward the transfer table. This now provides capacity for two freight cars on each track. The width of the original bay allows only one car on each of the next 12 tracks. Because the track next to the extended section is used for material handling, the capacity of this section is 11 cars. Both the original bay and the extension have overhead cranes. The section formerly occupied by the eight transverse tracks at the west end of the shop has been completely rebuilt for truck repairs. The transverse tracks have been replaced with four longitudinal tracks spaced across the bay. Cleveland tramrails and crossovers were installed over the tracks and machines in this section. Sixteen electric hoists with capacities from 1,000 to 3,000 lb operate over them. In addition to disassembly and assembly, the hoists service wheel and journal lathes at the end of the shop, and a welding booth which reclaims worn truck parts.

The recently rebuilt tread and journal lathes turn only mounted wheel sets removed from cars. All new mounted wheel assemblies are received from the system wheel shop at Glenwood, ready for installation. DuBois has no boring or wheel mounting equipment. Axles are Magnafluxed when the wheels are turned.

Opposite the extended bay are blacksmith, pipe and fabrication shops and a welding booth where car parts are reclaimed. Center sills are spliced and center plates, strikers and draft castings are built up.

The erecting shop has the three original tracks. A fourth track was installed through the machine bay at the west side of the building. This track is serviced with a new five-ton overhead crane running a little over half the shop length. The three tracks in the original erecting bay are served by two 60-ton cranes for their entire length. Pits under these tracks have been filled and a concrete floor installed. Convenient compressed air and electric welding outlets have been installed in covered pits at numerous points along the erecting tracks. Induction type rivet heaters and rectifier welding equipment are used. Each track

Hoists and tramrails cover truck repair area where worn bolsters and side frames are built up, and axles and wheel treads are trued. Wide use is also made of reclaimed body parts.

Blocked up cars now fill the tracks of the former boiler and tank shop. The original overhead cranes have become a part of the new car repair operation.

Tractors move the cars into the underframe and erection shops. Car puller at the right front will be used to pull the erection shop production line.

has a capacity of 10 cars with adequate working room around the car at each station.

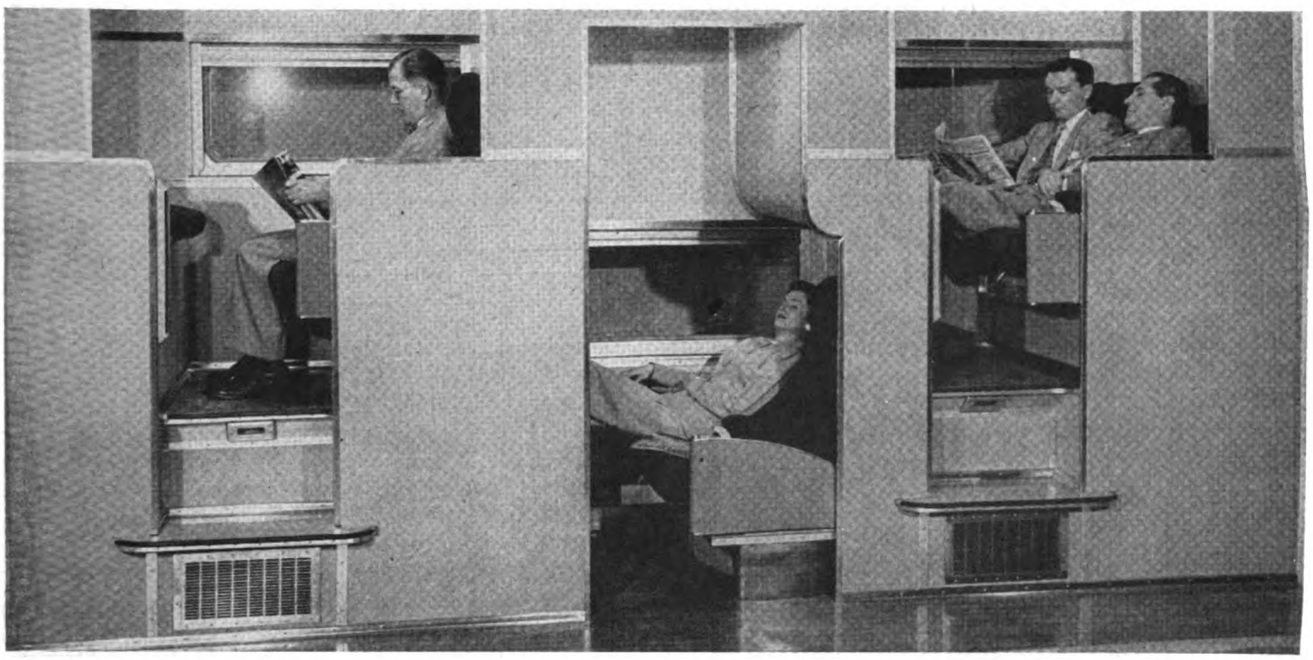
Along with the body, the brakes and safety appliances are completed in the erecting building. Air brake components are serviced at the system brake shop at Cumberland. Cars are moved to the paint shop located just to the north. The erecting shop has four electric car pullers. One is located between each pair of tracks at each end of the building and can move the line on a production repair set-up.

The only new building added during this conversion was the paint shop. This is an open sided structure, 280-ft long spanning the four tracks emerging from the erecting shop. It is equipped with 56 exhaust fans. Each track has a capacity of five cars under roof. Following spray painting, cars may be moved into the open for final stenciling and inspection.

Fabricated material is stored at many points close to the underframe and erecting shops. Locomotive cranes and power trucks combine with the overhead cranes to do the materials handling job in the new shop. This results in a minimum of interference on the floor around the cars being worked.

The former carpenter shop was rearranged to turn out car lumber and includes inside lumber storage. Modern locker and lunch facilities were installed. The power plant is equipped with two 600-hp gas-fired automatic boilers.

Production line facilities anticipate an output of 20 heavy car repairs daily. Light repairs known by the B&O as reconditioning repairs have occupied nearly all of the shop schedule. The reconditioning repairs turn out 45 open-top cars per day with a crew of nearly 400 men. The shop recently assembled 100 flat cars, using purchased underframes. This operation has been the only one in which a production line operation was achieved. Nine of these 53-ft 6 in., 70-ton cars were assembled daily.



Sit, sleep or recline . . . you can do them all in . . .

Pullman's Day-Nite Duplex Coach

Compared to Conventional DeLuxe Cars, New Layout Gives . . .

A new idea in coach accommodations has been devised by Pullman-Standard that should give the mechanical man something easier and cheaper to maintain at the same time it gives the passenger man a better service to sell.

The reduction in maintenance is expected to come from two sources. First, because of the duplex design, the new car can seat 56 people in nearly full recline vs only 40 under the same conditions in a regular single-line coach—therefore five such cars replace seven conventional ones, reducing running gear and other exterior maintenance by a third.

Second, interior cleaning and maintenance should be decreased by the extensive use of aluminum sheet and plastic coverings on the sides, ends and partitions of the car. The plastic is bonded to the wall structural surface under pressure for permanency and is not scratched even by most hard materials.

The 56-seat duplex car will probably cost about $20,000 more than a single-floor-level 40-seat de luxe coach—thus giving a more than third more seats for only about a sixth more cost. The total weight will also be increased much less than the seating capacity. AAR and RMS strength requirements will, however, be maintained in full.

Four men's and four women's private dressing rooms are available in the car and each is complete with hopper, washstand, dental bowl and mirror. The signs are reversible so that the eight can be made into any combination (e.g., 6 men's, 2 women's).

Extra large baggage and parcel spaces are located at

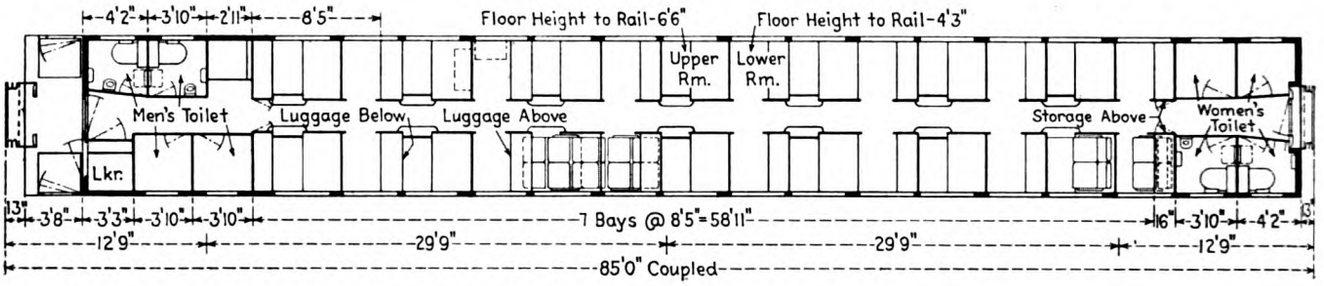
MORE

- ► Privacy and
- ► Washroom space
- ► Recline in the seats
- ► Room per passenger
- ► Passengers per car

BUT LESS

- ► Cost per seat
- ► Weight per seat

Chaise-lounge contour seats with elevated foot rests which are hinge-supported and fold out of the way when not in use, permit nearly full recline at night for passengers



the seats and large and heavy bags can be stowed easily and quickly. Space can also be provided for food and drink vending machines as a convenience to passengers and as an additional source of revenue for the railroads.

Deluxe seats in the upper and lower duplex rooms are of the individual reclining type. They have Latex foam rubber back and seat cushions, and are fabric covered. There are no center arm rests but each individual seat has an individual arm rest on the outside. Each seat has its own separate hinged leg rest for use when the seat is in the reclined position. Roomette type windows are provided in each accommodation.

Floors are rubber tile, and the entire car is insulated for both temperature and sound control. Windows are the sealed type with double glass. Each car has its own water cooler and drinking cup dispenser.

Air conditioning capacity is 8 tons with controls located on a single panel. Passengers can adjust air supply within individual seating areas by means of diffusers. The heating system is similarly centrally controlled with passengers having local manual control over specific areas of occupancy.

The Day-Nite-Duplex, while a new concept of luxury coach travel permitting nearly full recline at night in private or semi-private sections, imposes no rate or possible Pullman porter or Pullman fare controversy. It is a new coach accommodation and will not affect operation of section or roomette cars.

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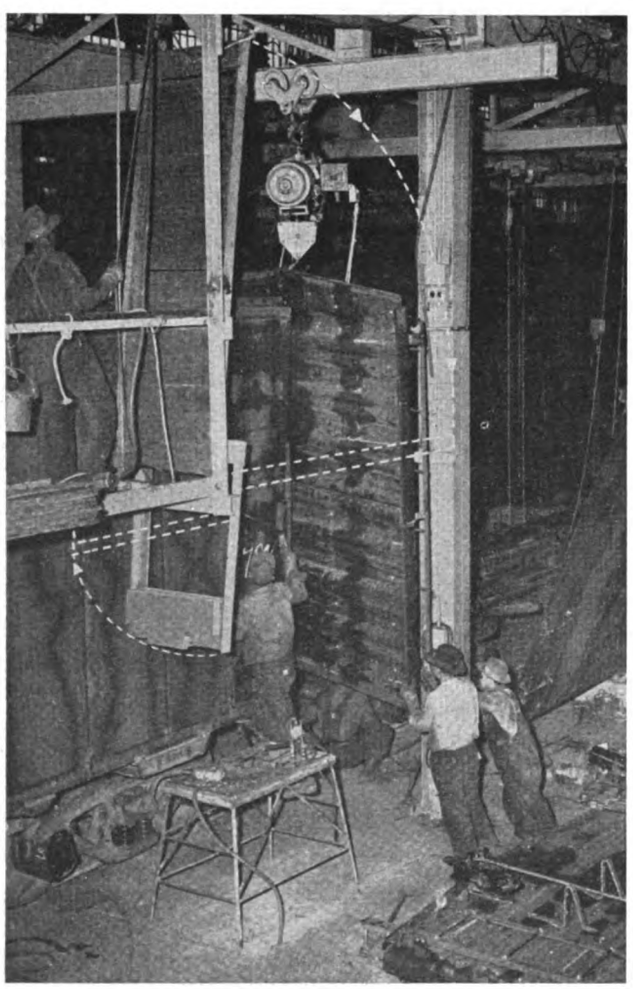


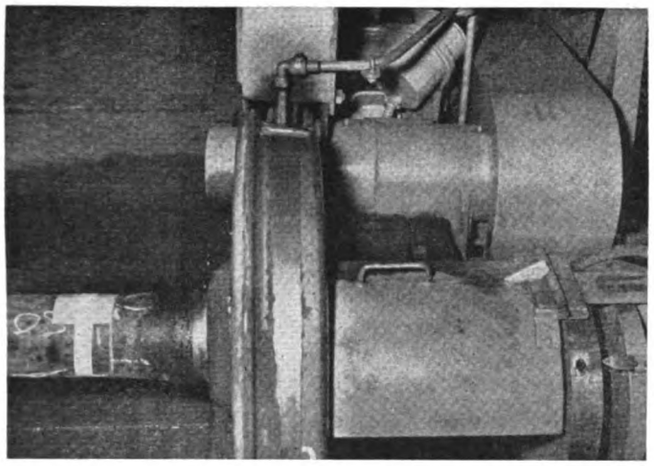
DRAWBRIDGE arrangement on that part of the scaffolding along the ends of the car is easily raised out of the way for operations on the end of the car

Car Men Modernize Their Own Production Setup

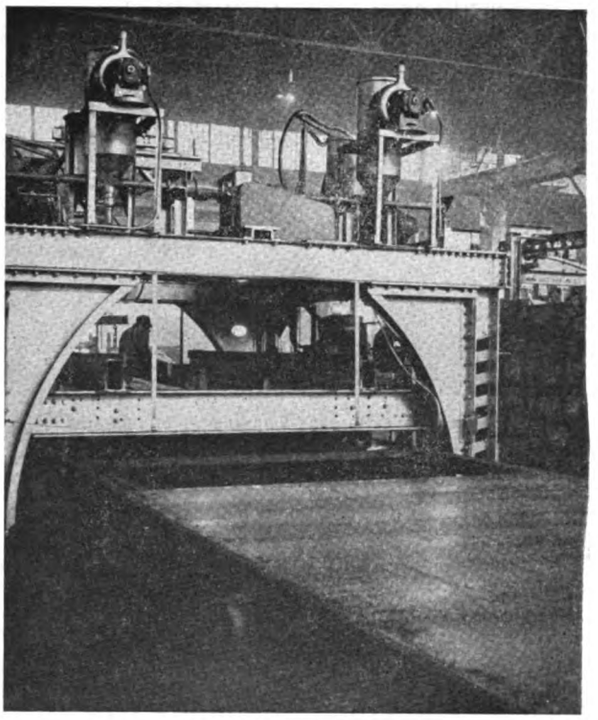
Faced with the alternative of being laid off for several months while their shop was being modernized or of doing the job themselves, the regular production workers at ACF's St. Louis plant switched temporarily from the building of freight cars to renovating their own shop. The result was a lower cost for ACF as well as uninterrupted employment for the work force. The procedure also gave the production workers a chance to include in the finished plant some of their own ideas based on their intimate knowledge of the work the plant would turn out.

The renovation started in April, 1954, and has cost $1.5 million to date. Total cost to provide the St. Louis area with this modernized facility will be about $2.5 million. Capacity will be up to 50 cars a day depending on the type.

Switching between types of cars to be built will be simple and inexpensive. Jig stands are movable and adjustable, and the fixtures themselves are saved for repeat orders of any given type car. Another interesting feature that combines flexibility with high production is a special block which positions the five tools needed

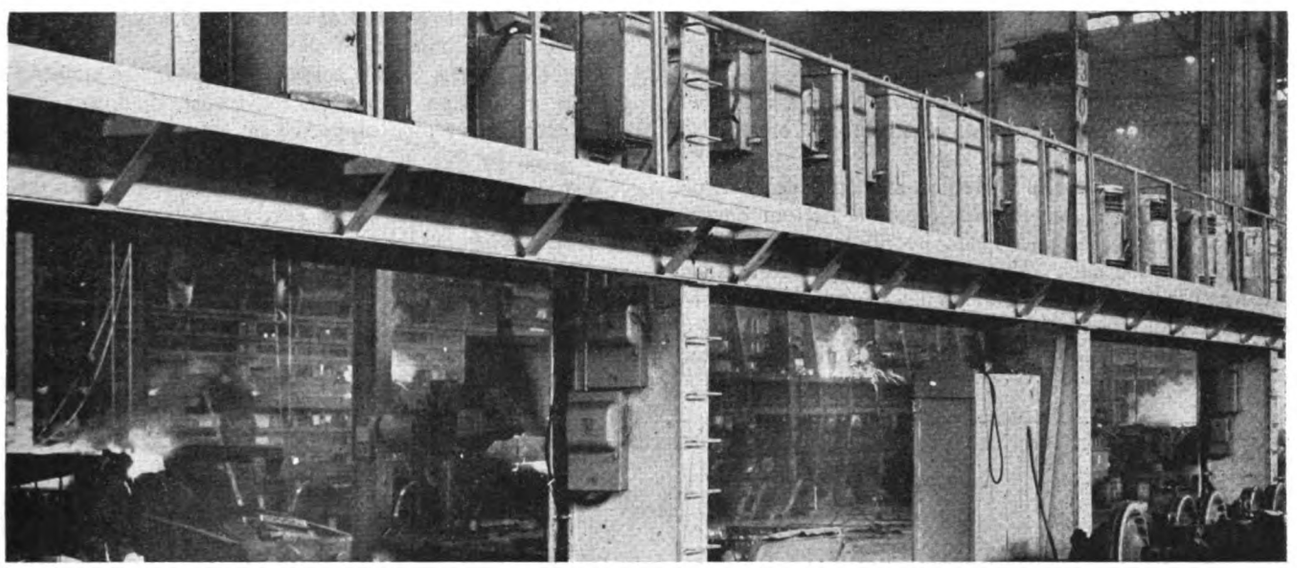


TREADS are cleaned up on all cast iron wheels in the wheel shop where six lathes, two burnishing machines and four boring mills turn out up to 210 wheel sets



THE HIGH DEGREE of mechanization extends to sub-assembly work like welding the side sheets to the side posts as well as to operations on the production line

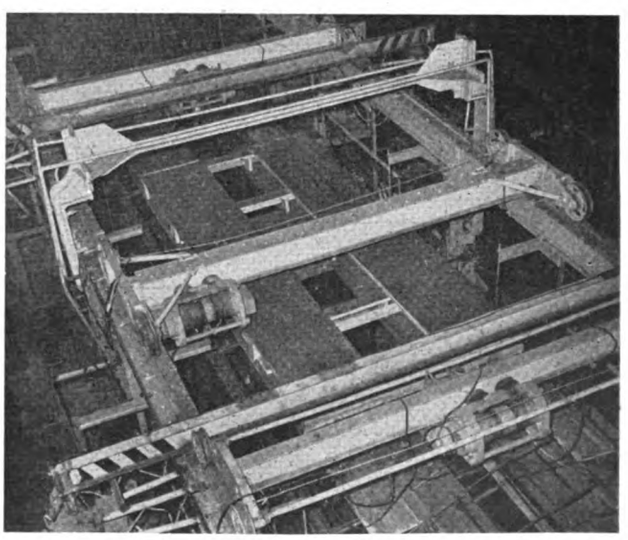
WELDING MACHINES are mounted on a balcony that runs along the production track and the leads are run underneath the floor to outlets for the operators, leaving the area around the erecting track uncluttered



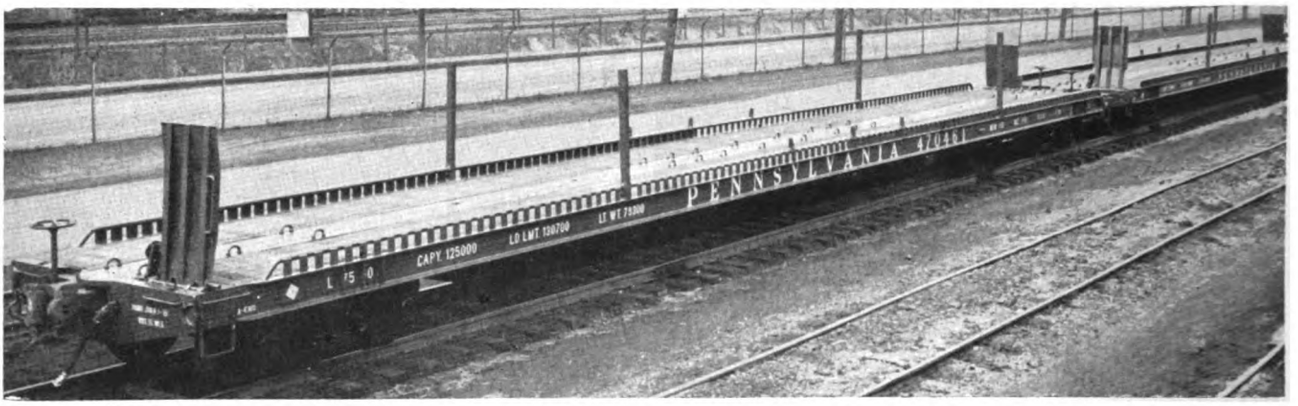
to complete all turning operations (journal, wheel seat, and all radii) on each end of the axle.

To set the tools for different sizes or types of axles, they are merely run up against a master axle guide and clamped in position. When on the machine, only the cross slide that holds the block needs to be adjusted for the proper diameter, and that only once each time a run of a different size axle is to be made.

Other features of the renovated plant are shown in the accompanying pictures.



HANDLING this set of interior scaffolding is but one of many tasks performed by the versatile system of small traveling cranes which run the length of the erecting track. Two hoists cover each work position. At the earlier stages each hoist feeds parts to the underframe, then the two team up to move the underframe to the next position. At the later stages one hoist extends beyond the rails to pick up sides, ends, ladders and other heavy exterior parts. Current is collected from below and the wire protected from cranes by an n-shaped cover



Two of the TrucTrain cars—each long enough to carry two standard trailers—ready for delivery to the Pennsylvania.

PRR TrucTrain Cars

The 75-ft flat cars put into the Pennsylvania Railroad's TrucTrain service between New York, Philadelphia, Pittsburgh and Chicago on March 3, 1955, were designed primarily for the safe, efficient and speedy handling of two highway trailers per car. The design, in which Bethlehem cooperated with PRR engineers, also provides for a secondary objective: namely, a car meeting AAR Loading Rule requirements and therefore suitable for general service. Two hundred of these cars were recently completed at the Bethlehem Steel Company's Johnstown, Pa., plant.

The car underframe is a welded structure using two 30 in. wide flange beams with top and bottom cover plates for center sills and 12-in. by 35-lb car building channels for side sills. Mayari-R low-alloy high-tensile steel was used in center and side sills, as well as in other parts of the structure subjected to high stresses.

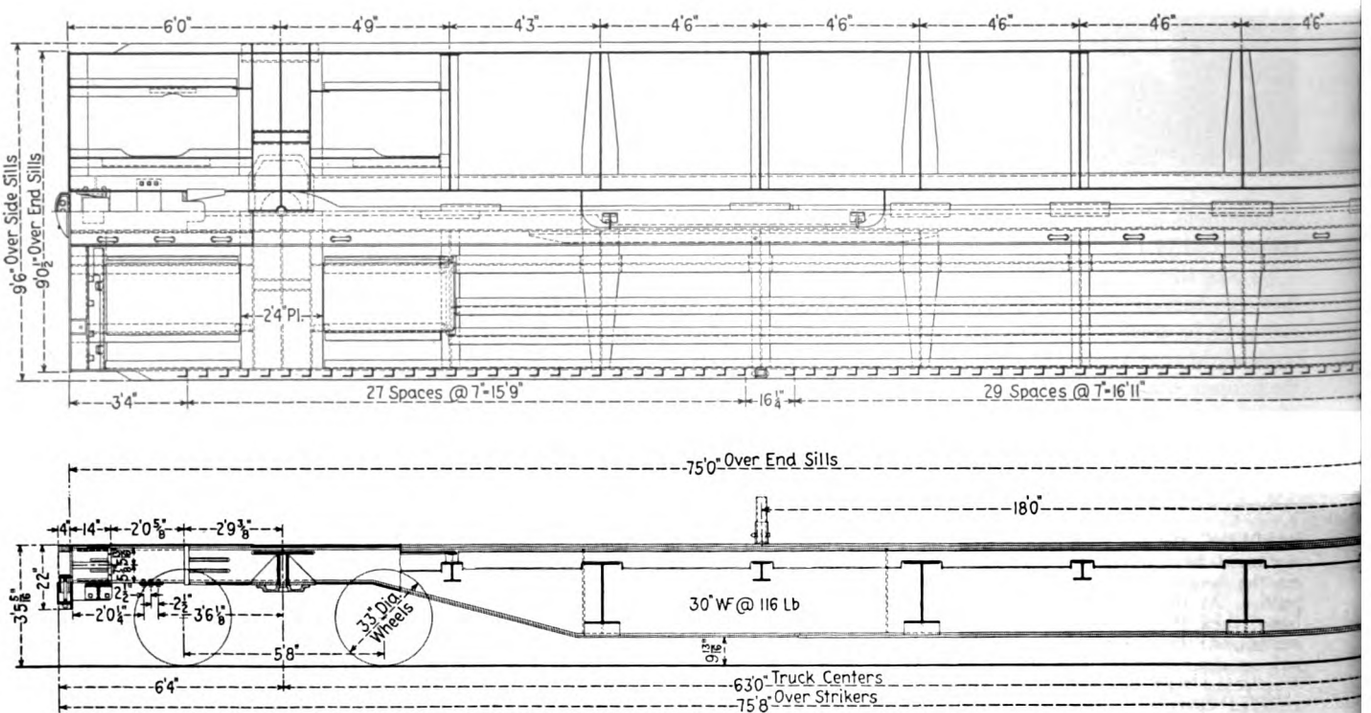
Cross members are of the welded web and cover plate type, except the cross ties, which are 6 in. by 15.5 lb wide flange beams.

Oak decking, 2⅜ in. thick, flush with top of side sill channel, extends between side and center sills and is supported on three rows of floor stringers, on each side of center sill, two of which are 4 in. by 8.2 lb Z sections. The stringers adjacent to the center sill are 6 in. by 15.5 lb wide flange beams; heavier stringers are required at this location to take the reaction from trailer supporting jacks. Decking is secured at side sill and inside stringer with watertight bolts and welding studs.

The side curbs which serve as a guide in spotting trailers and as an anchorage for trailer tie-downs are 2 in. extra heavy pipe supported on side sills by 3½ in. by 2½ in. by 5/16 in. angle columns.

A tool box with flush hinged lid is built into the center sill at each end of the car, where tie-down equipment, Duff-Norton jacks, wheel chocks, and jacking beams can be carried when the cars are in general service or moved empty.

The cars are equipped with AAB-1012 freight brake equipment with two reservoirs and two 10 in. cylinders,



PRINCIPAL DIMENSIONS AND WEIGHTS

Length over end sills, ft-in	75 0
Length over strikers, ft-in	75 8
Length between pulling faces of couplers, ft-in	78 4-3/4
Truck centers, ft-in	63 0
Width over side sills, ft-in	9 6
Width between curb rails, ft-in	8 10-1/2
Height—rail to top of floor—light car, ft-in	3 5-5/16
Height—rail to bottom of center sill, ft-in	0 9-9/16
Weight of trucks, lb	19,190
Weight of body, lb	60,210
Light weight of car, lb	79,400
Capacity, lb	125,000
Load limit, lb	130,000

one cylinder piloting a relay valve to supply air to the second cylinder. Two Universal drop staff type hand brakes, one located at each end of car, operate independently, one for each truck.

Each car is equipped with the following special equipment for securing trailers to the car:

Jacks, screw type: 4 front and 4 rear.

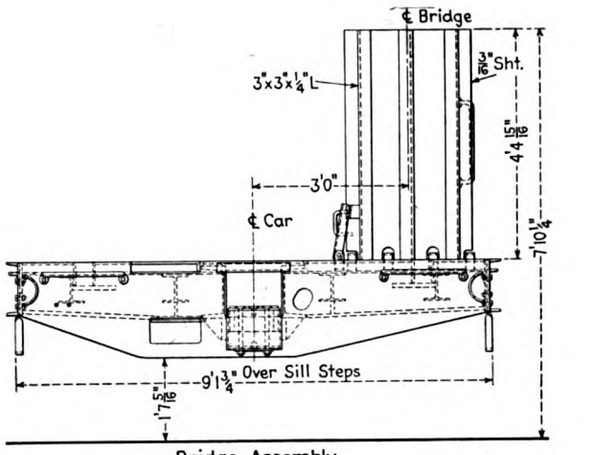
Tie-down units: 16, each consisting of 3/8 in. high tensile chain, ratchet load binder, snubber, and hooks for attachment to trailer and car anchorage.

Jacking beams: 4, cast steel, self-locking.

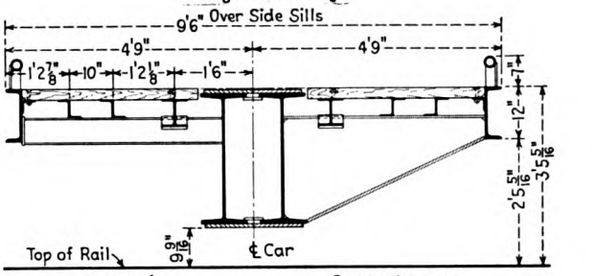
Wheel chocks: 4, with locking bars.

Transport of trailers from one car to another is accomplished by means of hinged bridge plates, located at diagonally opposite corners of the cars. When cars are moving these bridges are held in a vertical position.

These cars are equipped for high speed freight service, with Type F couplers, National Malleable Type MF 275-1 rubber cushioned draft gears and spring plankless $3^{11}/_{16}$ in. spring travel, SKF and Hyatt roller bearing equipped trucks equipped with 33 in. multiple wear steel, heat-treated wheels. Trucks are ASF pedestal type with A-3 ride control package and Buffalo unit brakebeams.

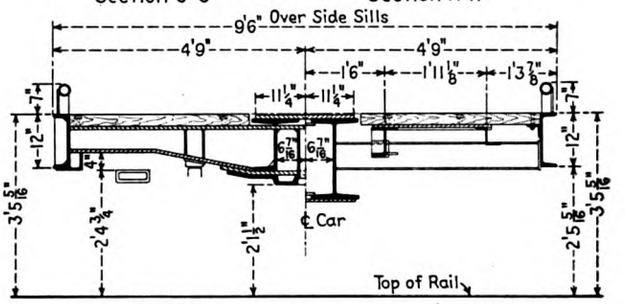


Bridge Assembly



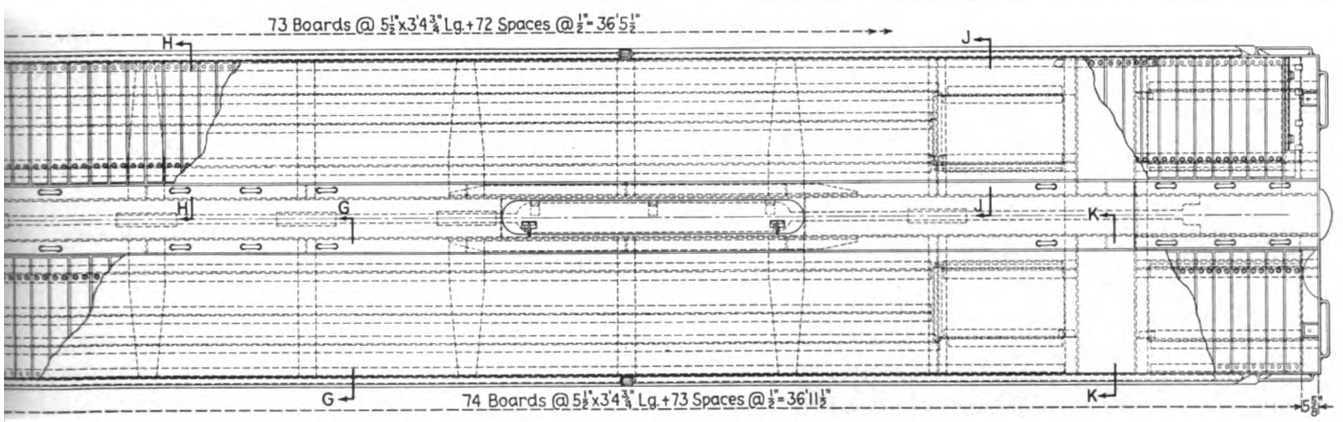
Crosstie Section G-G

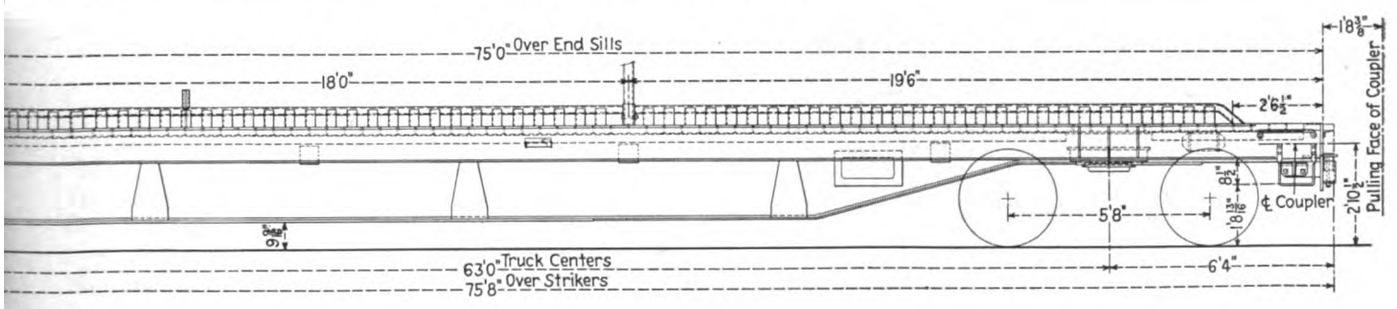
Cross-bearer Section H-H

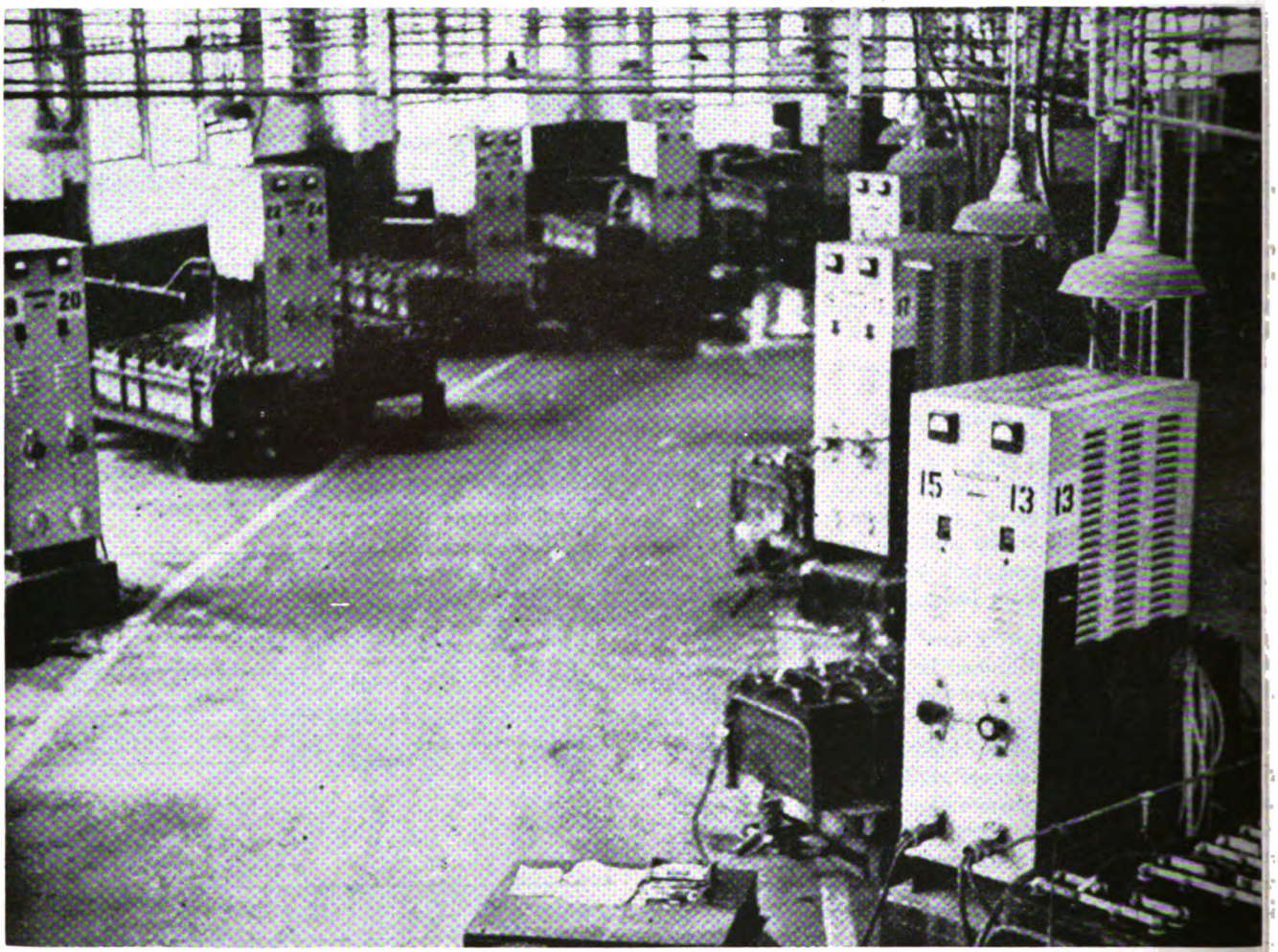


Bolster Section K-K

Crosstie & Wheel Section J-J







General view of the interior of the shop showing the arrangement of charging cubicles.

Every Railroad Must Have a Battery Shop

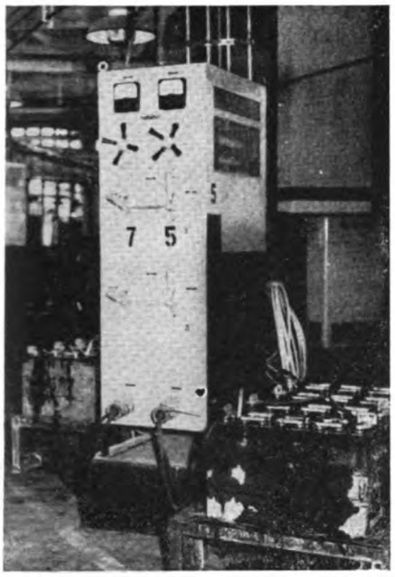
Operators using one of the portable discharge stands to check battery capacity.

On the Santa Fe at San Bernardino, a roundhouse was transformed into a first-class battery shop

■ All lead-acid storage batteries used on the Santa Fe's Coast Lines are overhauled in a newly equipped shop at San Bernardino, Calif. These include 32- and 64-volt batteries for both cars and locomotives.

New locomotive batteries normally stay in service two years. They are then brought into the shop for capacity tests and any necessary repairs. Succeeding shoppings are made at one-year intervals. Car batteries are sent to the shop at car repair periods.

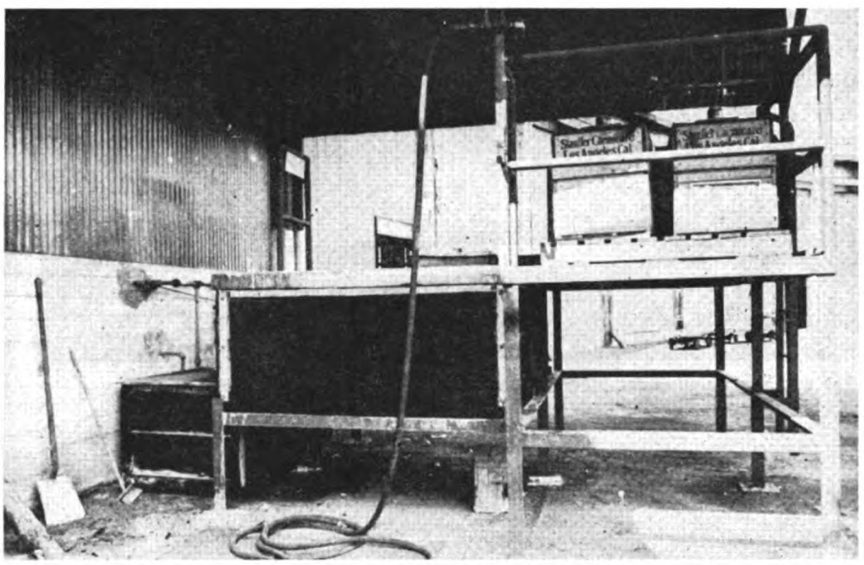
When a battery comes into the shop, measurements are made of open-circuit voltage and specific gravity. It is then flushed with distilled water and placed on charge. The initial charge is four times the eight-hour



In each cubicle there are two sets of resistors and controls and meters which may be used for charging or discharging.

The shop is equipped for all types of repair work.

A lead-burning torch doubles as a sealing tool.



Acid purchased in carboys is mixed with water to make electrolyte in an open shed outside the shop.

rate, and this is continued until the temperature of the battery rises to a value between 115 to 120 deg F. The charge is then reduced to the finishing rate and is continued until the cadmium voltage readings of the pilot cells are reversed. The battery is then said to be standardized.

The battery is then left on open circuit overnight and the next day is given a capacity discharge test at the five hour rate. If the voltage is 1.83 volts per cell at 80 per cent of discharge, it is recharged at the finish rate and returned to service. If it fails to meet this specification, it is given a shopping.

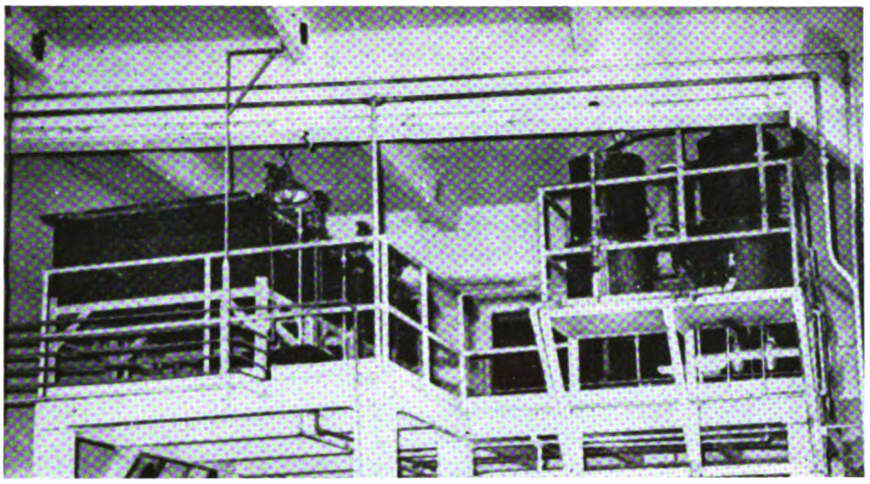
The shop has 20 charging cubicles each of which may be used to charge two batteries. Power is supplied to the cubicles by overhead lines and charging current is controlled by resistors in the cubicles. Most of the cubicles may also be used for discharging batteries and there are, in addition, seven portable discharge stands.

New batteries and reconditioned batteries awaiting service are kept in a fully charged condition by means of an automatic constant-voltage battery charger known as a Flotrol. It is a rectifier with a saturable core reactor which maintains precise voltage—35 volts—independent of load.

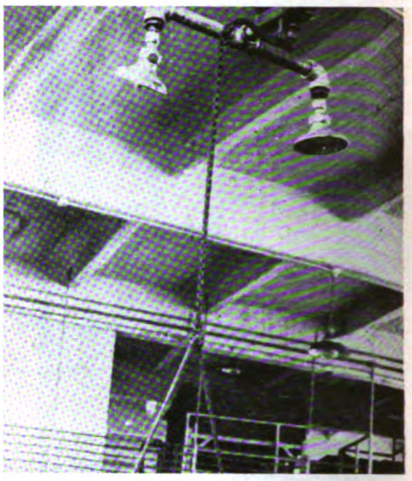
To reduce the time required for regular charging and permit higher charger rates in hot weather, batteries are vapor sprayed during charge. This is accomplished by three spray heads over each battery. The spray is little more than mist and use of water is very small.

The shop occupies 12 stalls of an enginehouse originally used for steam locomotives. The ceiling has been painted white, side walls are a sea foam green, with a five-foot maroon strip along the lower edge. The floor is covered with an acid, resistant mastic.

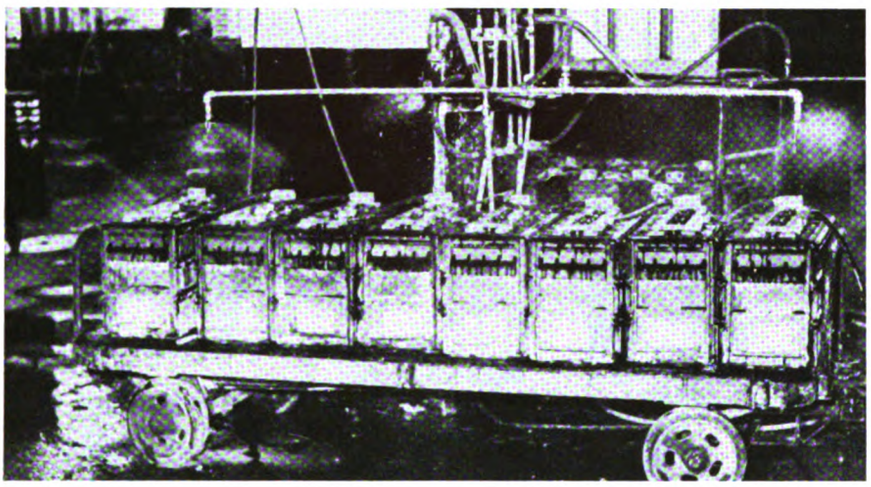
A pressurized generator room is built into the roundhouse, along the inner edge. Ventilating air is brought



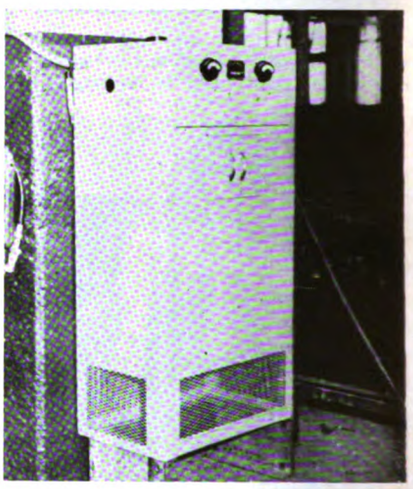
Electrolyte and distilled water are stored on a balcony from which they are supplied to the batteries by gravity.



Emergency showers and barrels of soda are placed at strategic points around the shop.

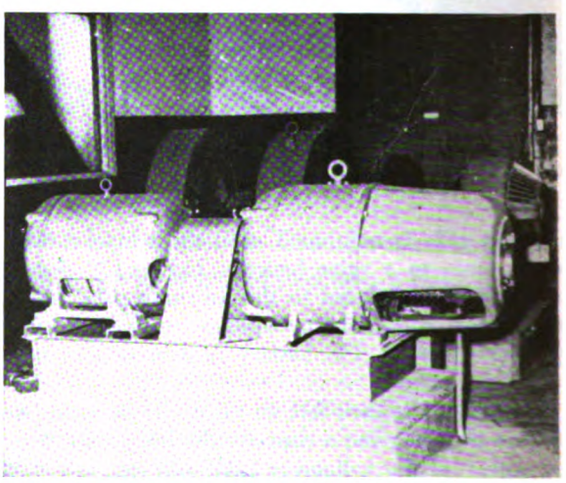


In hot weather, water sprays prevent overheating of batteries on charge.



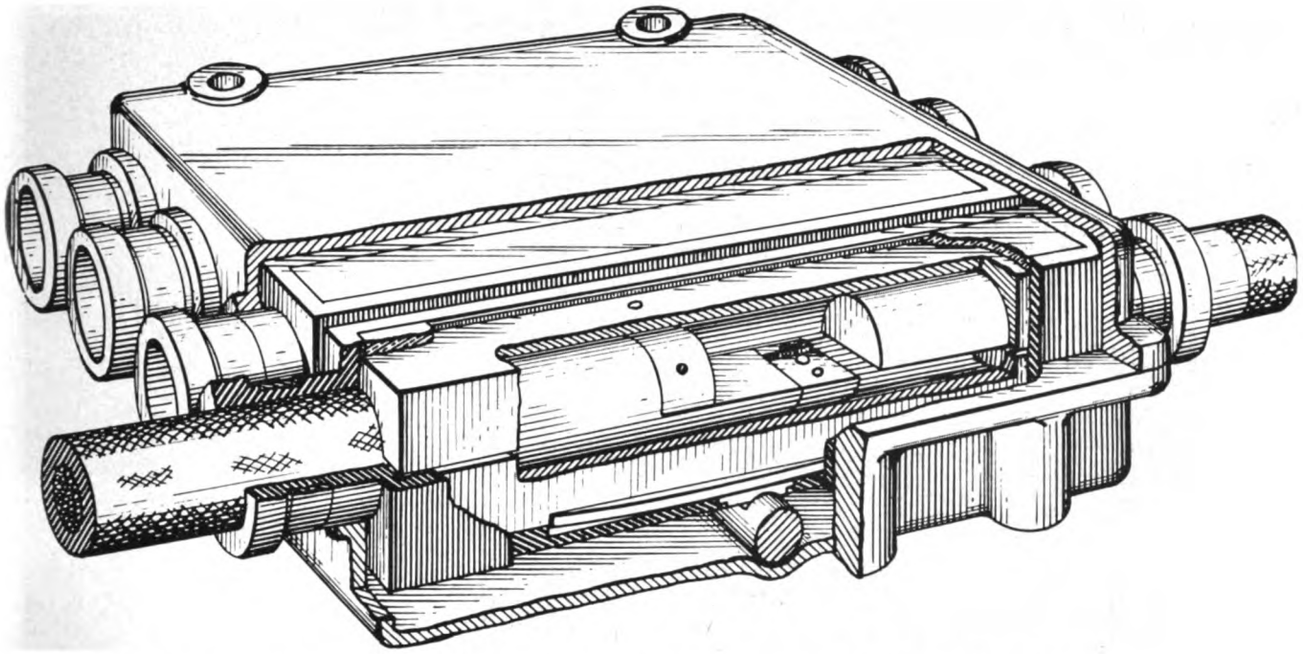
The constant-voltage rectifier used to keep new and repaired batteries in top condition.

New and repaired batteries on the 35-volt circuit, ready for service.



The two motor-generator sets which supply battery charging current.

in through the roof by a motor-driven locomotive fan. Battery charging current is furnished by two motor-generator sets. One supplies 500 amp at 90 volts, and the other 2,000 amp at 50 volts. The 90-volt machine is used for charging locomotive batteries. These machines supply the charging cubicles through overhead loop circuits. Each cubicle is fitted with Allen-Bradley resistors controlled by thermal breakers, and carbon-disc variable resistors. Each cubicle has two ammeters used for both charging and discharging. The shop is equipped for all repair work including lead burning, sealing and rebuilding and replacing of elements and containers.



Operating principle of the switch is shown by this cutaway section of the type used for EMD style clasp connectors

Motor Disconnects Aid Maintenance

Leads are protected from chafing and may be connected or disconnected in minutes.

■ A new type of quick-disconnect for diesel locomotive traction motor leads has been on test for the past six months in passenger service on western roads. During this time, it accumulated about 123,000 miles of service. Motor leads were removed each month in the course of the test and all connections checked and leads inspected.

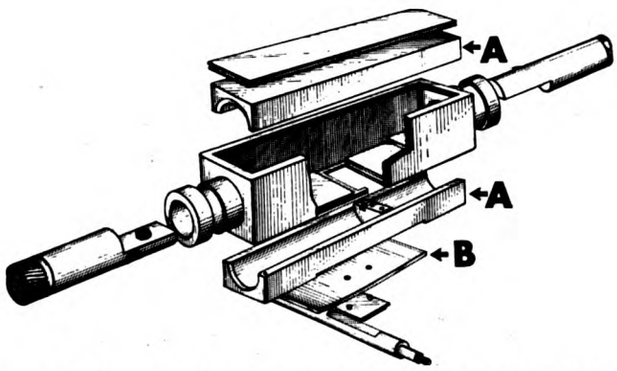
At no time was any difficulty experienced with the application. Shortly after application, the locomotive unit had a negative wire burned open in the trainline receptacle when running as the third unit. This caused the reverser to throw and did serious damage to the traction motors, but with no damage to the switch.

The device consists of a water-tight aluminum casing weighing 48 lb and measuring 12¼ in. by 13⅝ in. by 3 15/16 in. The aluminum is anodized and other metal parts are cadmium plated to prevent corrosion. All contacts are silver plated and held together by mechanical pressure to eliminate loose or hot connections.

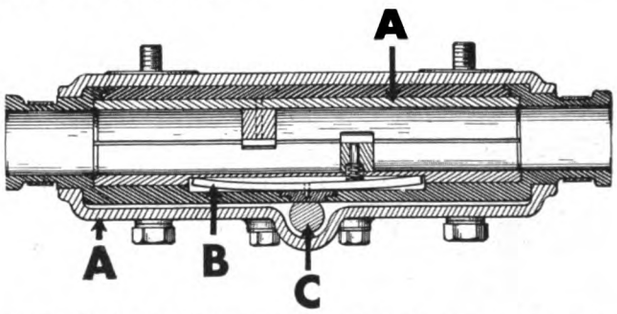
The quick-disconnect switch requires no auxiliary parts to adapt it to any existing make of diesel unit. Different models of the basic unit fit the different types of connector used. The unit is mounted to the underframe and is completely watertight. The latter feature eliminates the need for insulating tape over the area around the connections, and saves the time formerly required to remove and re-apply such tape each time the leads are broken. The watertight feature also eliminates the grounds that are experienced with the conventional connections when insulation ages and deteriorates.

Connection is made by simple movement of the handle. This gives a positive pressure connection (approximately 850 lb), and locks against road shock and vibration. Neoprene bushings where the cables enter the housing prevent chafing the insulation in this location.

The switch is manufactured by the Torman Company, 8119 Lake Street, River Forest, Ill.



One unit of the switch showing the contacts A which are bored out to the O.D. of the connectors and which clamp them by pressure applied through spring plate B



Turning the handle 90 deg turns cam C, pushing against the spring plate B and squeezing the contacts A tightly around the connectors

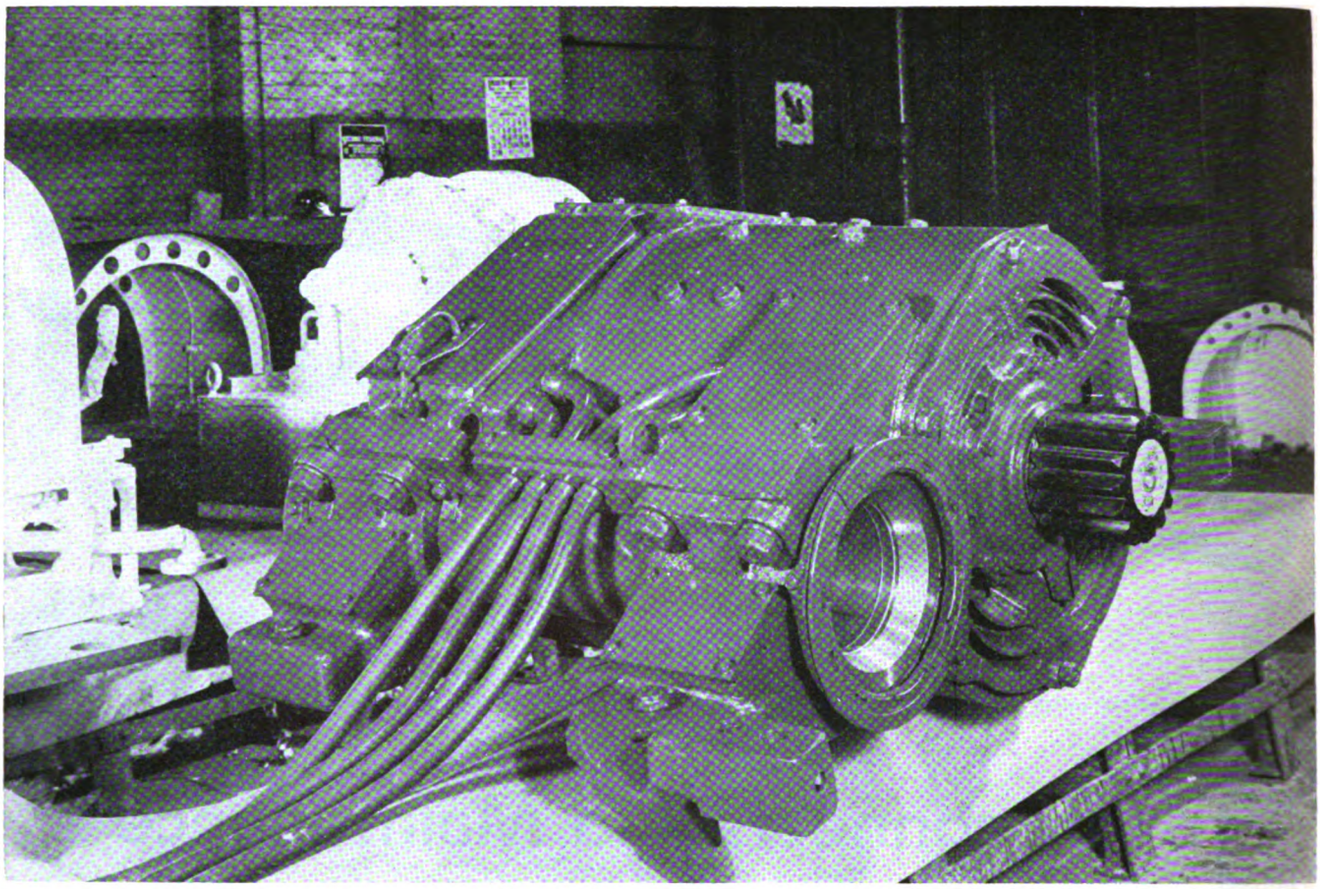


Fig. 1—Typical axle-hung traction motor.

Long Life Without Failures for Gears

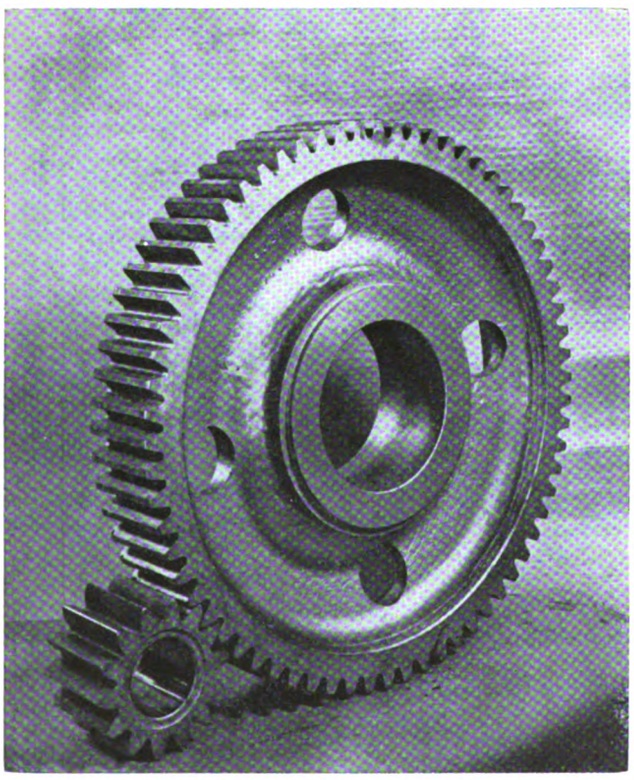


Fig. 2—Traction motor gear and pinion.

Different contours on opposite sides of pinion teeth assure wide tooth contact with little wear and few fatigue or shock failures

By W. P. WELCH and M. C. WINSTANLEY
Westinghouse Electric Corporation
East Pittsburgh, Pa.

■ Locomotive gearing on present day electric and diesel-electric locomotives operates under very high tooth loading when compared with almost any other type of industrial gearing. On diesel-electric locomotives, the traction motor is generally axle-hung, and is typified by Fig. 1. Spur gearing of relatively coarse pitch (2 to 3 diametral pitch) is employed, giving a reduction ranging from 4.5:1 for freight locomotive applications (Fig. 2) to 2.5:1 for high-speed passenger locomotives.

Although this gearing is usually hardened to a high hardness level for strength and wear resistance, and then finished by grinding to obtain highly accurate tooth profile and spacing, the severe service imposed has resulted in gearing failures, especially where the locomotives are used in heavy, high tractive-force, freight operations. The problems of wear, excess pitting and scuffing of the teeth are serious and limit the useful life of the

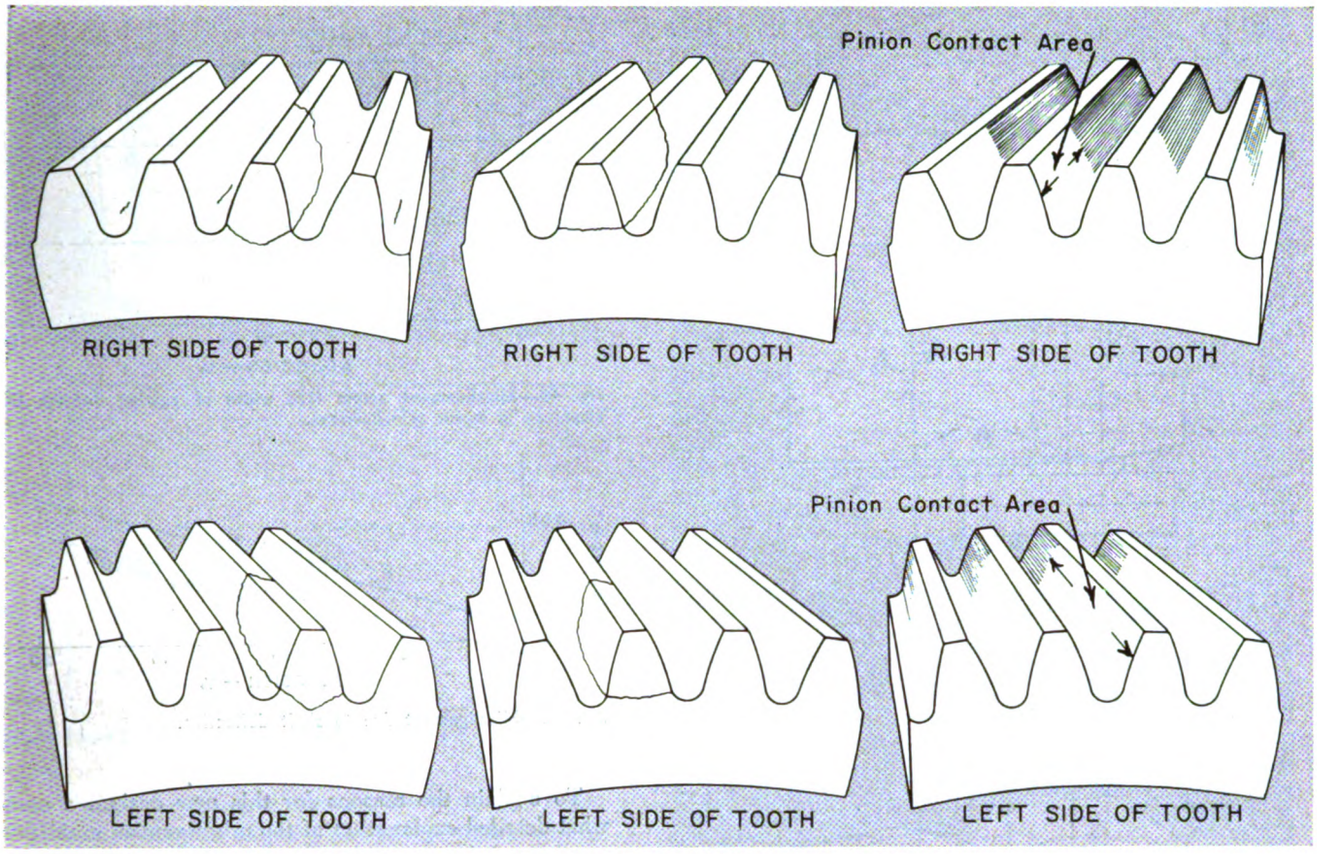


Fig. 3A (left)—Typical fatigue crack pattern. Fig. 3B (center)—Fracture pattern due to shock or impact load. Fig. 3C (right)—Wear pattern on axle gear due to operation with straight ground pinion.

pinions and gears, but it is the occurrence of tooth failures that is of really major consequence, since it is difficult to avoid road breakdown from this cause by preventive maintenance.

Wear limits have been established for most types of railway pinions and gears, and if the gearing is condemned in adherence to these standards no operational trouble is to be expected from wear, except possibly in the case of locomotives in long-distance high-speed service where excessive vibration due to worn tooth profiles may damage other parts.

Usually, cases of excessive rates of wear can be traced to one of three causes: (1) not maintaining sufficient lubricant in the gear case; (2) abrasive matter in the lubricant; or (3) excessive clearance in motor axle bearings. Poor maintenance of gear cases and their seals can be the obvious reason for either of the first two causes.

Tooth breakage is sometimes a catastrophic type of failure resulting in a road breakdown of the locomotive, this being virtually always so when the failure is on the pinion. Tooth failures generally fall into one of two types:

1. A fatigue failure, one that results from many thousands of load applications of a value slightly higher than that which the tooth can endure.

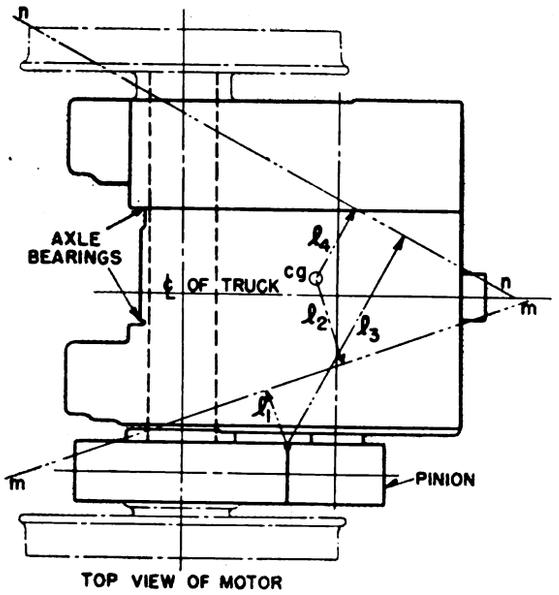
2. A shock or impact failure, due to a tooth load much higher than the endurance strength of the tooth, applied perhaps only once or perhaps 10 or 100 times.

The unique aspect of the fatigue failure is that it starts as a very small crack, which progresses in size under additional load cycles, until finally a portion of the tooth breaks out. Figure 3A shows how a fatigue fracture progresses across the base section of a tooth, the initial direction of the path being perpendicular to the tangent to the tooth fillet at the point of origin. Contrary to what might be guessed, the cracks do not start at the extreme end of the tooth, but at a point three-fourths to one inch in from the end of the tooth.

A shock failure displays a different pattern, as shown in Fig. 3B. Here the path of the fracture tends to take the shortest distance across the base of the tooth. Moreover, the familiar indications associated with the progressive fatigue failure do not appear on the fracture surface, for in a shock failure the fracture occurs very suddenly.

Locomotive gearing, in addition to being heavily loaded, is forced to operate under severe conditions of misalignment on account of the mounting of the axle-hung traction motor. This leads to very poor load distribution across the face width of the teeth, resulting in a high concentration of load on the motor side of the pinion and the gear. The tooth stresses are correspondingly increased in the vicinity of the load concentration, which is borne out in service by the fact that until recently, fatigue cracks have always begun on the motor side of the gear or pinion. Figure 3C shows a typical wear pattern obtained with normal, parallel ground gears and pinions. It has been estimated that, due to this effect alone, the peak stresses are increased to almost 300 per cent of what they would be if the gearing were operating under conditions of perfect alignment in which the load is distributed uniformly across the tooth's face width.

For eight or ten years in this country, pinions having



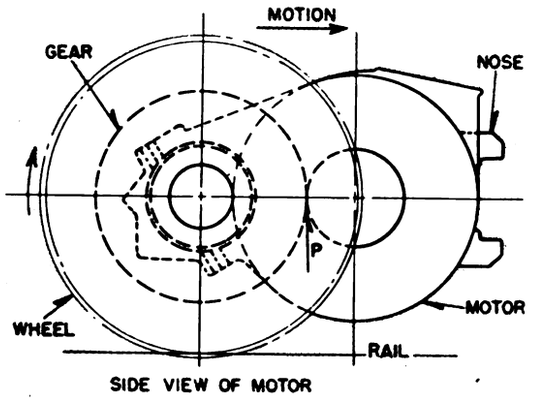


Fig. 4A—Condition causing tilting of motor frame in clearance of axle bearings.

teeth uniformly tapered in width have been used to alleviate this condition. However, this simple provision is not enough, as will be seen from the discussion that follows, so that only a very partial improvement can be gotten with a uniform taper of the teeth. More recently, a refinement of this scheme has been introduced, by means of which very excellent conditions of alignment are attained. Comparison of these newly developed pinions with the older, uniform taper pinions, by means of careful observations of wear patterns on gears in service on locomotives working in heavy duty, show that the new pinions are a major advance in achieving good load distribution across the entire face width of the gearing.

The refinement consists of grinding a different taper on one side of the tooth as from that on the other side of the tooth. The difference in taper, however, is major. One side of the tooth has very little taper, while the other side has what heretofore would have been considered an excessively large taper.

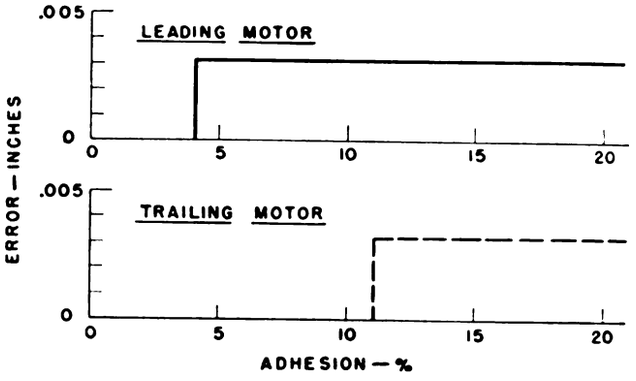


Fig. 4B—Misalignment across face width of gearing due to .020" clearance in motor axle bearings.

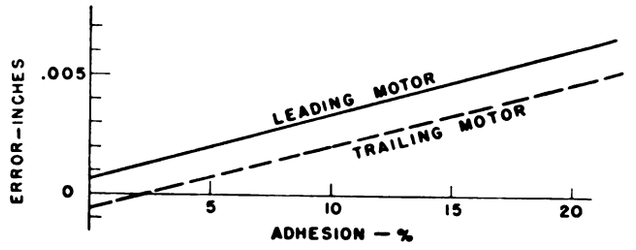


Fig. 4C—Misalignment due to shaft deflection.

To explain the reasons for this new design, a somewhat detailed explanation of the misalignment conditions on the axle-hung traction motor will have to be given. The major components contributing to this misalignment are:

1. The tilting of the motor frame in the clearances of the motor axle bearings.
2. The bending of the armature shaft as caused by the bearing tooth load.
3. The tilt of the gear due to the bending of the locomotive axle as caused by the locomotive weight.

It is evident that (1) and (2) depend upon the tractive force being exerted by the locomotive, but factor (3) does not.

Motor tilt in axle bearings is shown in Fig. 4A. When the locomotive is working in a direction such that the motor is leading the axle, the tooth load on the axle gear is downward. This tends to rock the motor about the axis *N-N*, which passes through the opposite axle bearing and the motor nose. This tilting force is resisted by the weight of the motor acting at the lever arm *L4*. When the tooth load *P* and the corresponding tractive force of the locomotive build up to a sufficiently high value, the motor weight is overcome and the frame tilts through the bearing clearance. This, of course, creates a misalignment across the face width of the gearing.

The amount of this error depends upon the clearance in the motor axle bearing. When new, this is as low as .010 in., when worn, as much as .060 in. The solid line in Fig. 4B shows the amount of this error for .020-in. clearance in a typical case when the motor is leading the axle. Below a tractive force corresponding to four per cent adhesion, no tilting occurs. Above four per cent adhesion, the motor operates in the tilted and misaligned condition.

When in Fig. 4A, the motion is to the left, the pinion pushes upward on the gear, tending to rock the motor about the line *M-M*. Since the moment arm in this case

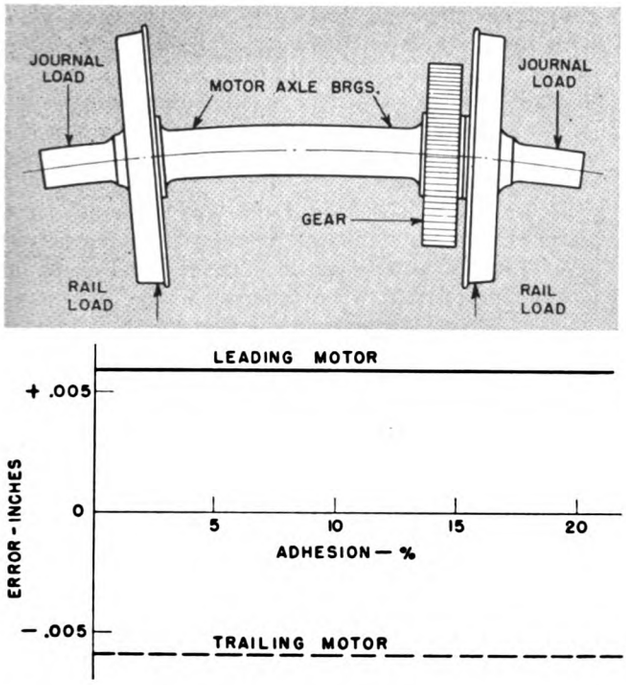


Fig. 5B—Misalignment of gear due to bending of axle.

is very short, *L1*, compared with *L3*, the tooth load *P* has to build up to a much higher value before tilting occurs. This is shown in Fig. 4B by the dotted curve, which comes into play at tractive force corresponding to 11 per cent adhesion.

The misalignment error in Fig. 4B, and in the other figures is expressed in inches misalignment across the face width of a typical gear or pinion.

The second component is the error caused by the bending of the motor shaft because the pinion is overhung. The amount of this misalignment obviously is proportional to the tooth load and is modified only by the deflection of the shaft due to the armature weight. This causes the results, as presented in Fig. 4C, to be slightly different for the two directions of armature rotation.

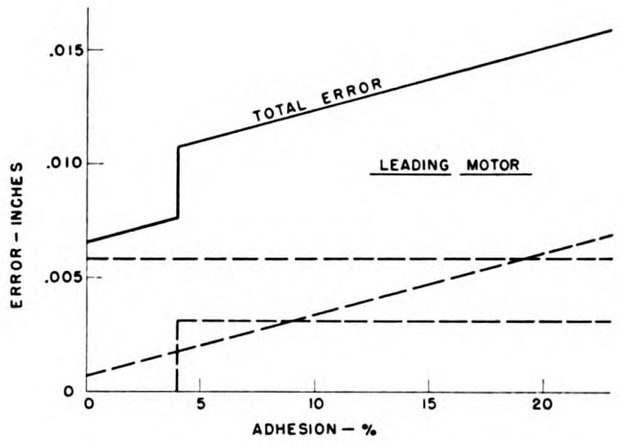
The third large factor is the one that is usually overlooked. Figure 5A shows in a greatly exaggerated manner the deflection curve of a locomotive axle when supporting the weight of the locomotive. The axle gear obviously tilts due to being mounted adjacent to the wheel, and the amount of this tilt can be readily calculated from the axle dimensions and the journal box loading.

The curves in Fig. 5B show two unusual aspects of this misalignment. First, it does not depend upon tractive force. Second, it causes a concentration of tooth load on the motor side of the gearing when the pinion pushes down on the gear, but it loads the wheel side of the gearing when the pinion pushes upward on the gear. Thus, in the first case, the error adds to the previous two errors, but in the second case this error is subtractive.

All three components are added algebraically in Fig. 6, for a leading motor, and for a trailing motor. In each diagram, the three components are shown as dotted lines.

These diagrams show that the misalignment error increases rather rapidly with tractive force, taking a jump at the point when the motor tilts through the axle bearing clearance. Note that the error starts out with a

Fig. 5A—Bending of locomotive axle due to locomotive weight.



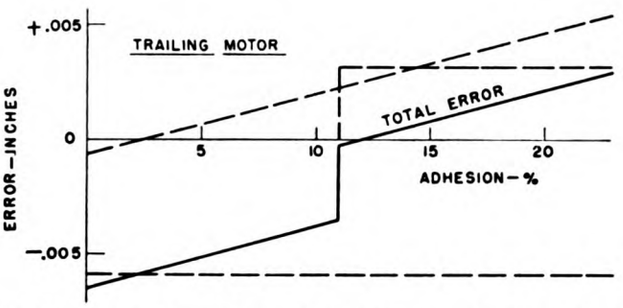


Fig. 6—Total misalignment across face width of gearing for a typical traction motor. Motor leading the axle.

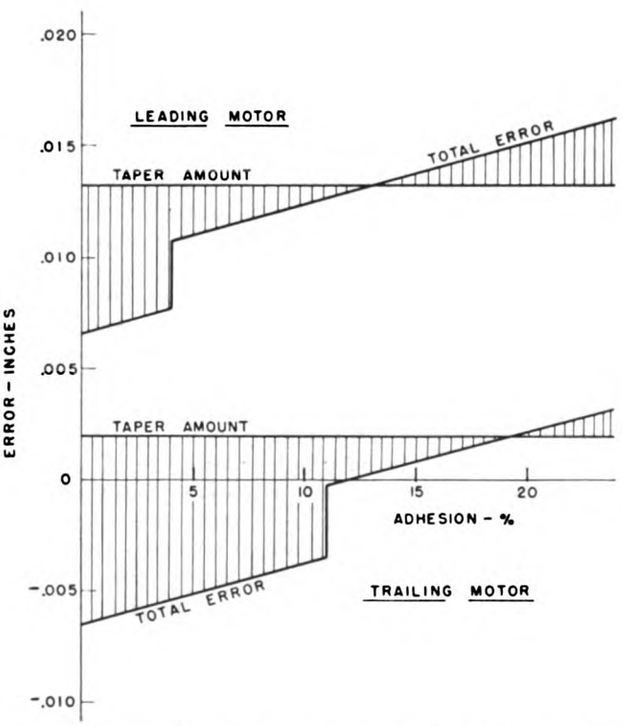


Fig. 7—Effect of selected taper amounts on reducing the net misalignment, which is shown by shaded areas.

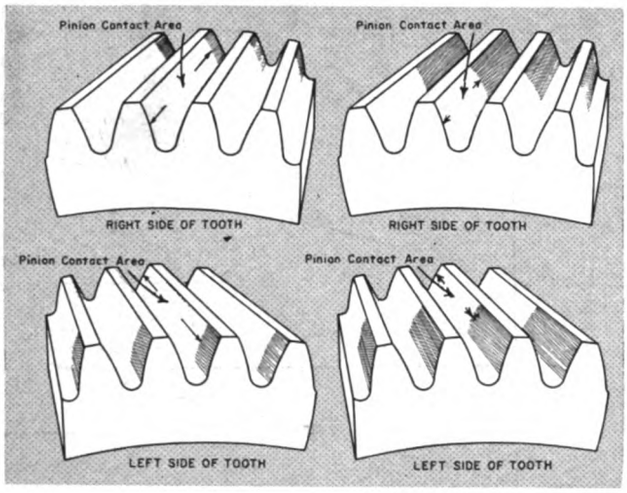


Fig. 8A (left)—Wear pattern obtained with Heli-taper pinions. Fig. 8B (right)—Wear pattern obtained with pinions having uniformly tapered teeth.

negative value for the trailing motor case. Thus, it is evident that 100 per cent correction of this total error cannot be made by altering the tooth shape on either the gear or the pinion.

A highly significant fact, however, is that the tooth stresses are low at the low tractive forces. The area in which misalignment correction is important and essential is the region above tractive forces of 10 per cent adhesion. In this region, the misalignment errors do not vary over too wide a range, and the intelligent selection of a taper amount, one for each side of tooth, from diagrams similar to Fig. 6, can produce tremendous reductions in peak tooth stresses.

It is necessary to apply the taper only to the gear or to the pinion. Since the pinion has fewer teeth, in practice, the taper is applied to the pinion teeth, this being the less costly procedure. Shown in Fig. 7, is a replot of the two total error curves with the selected taper amounts shown on the curves as straight horizontal lines. For any tractive force, the net misalignment with the taper ground pinion is the difference between the total error curve and its mated taper amount curve (or straight line). Note that for the case where the motor leads, the right side of the pinion tooth is the working face, whereas for the trailing motor, the left side of the tooth is the working face, viewing the top tooth from the motor side.

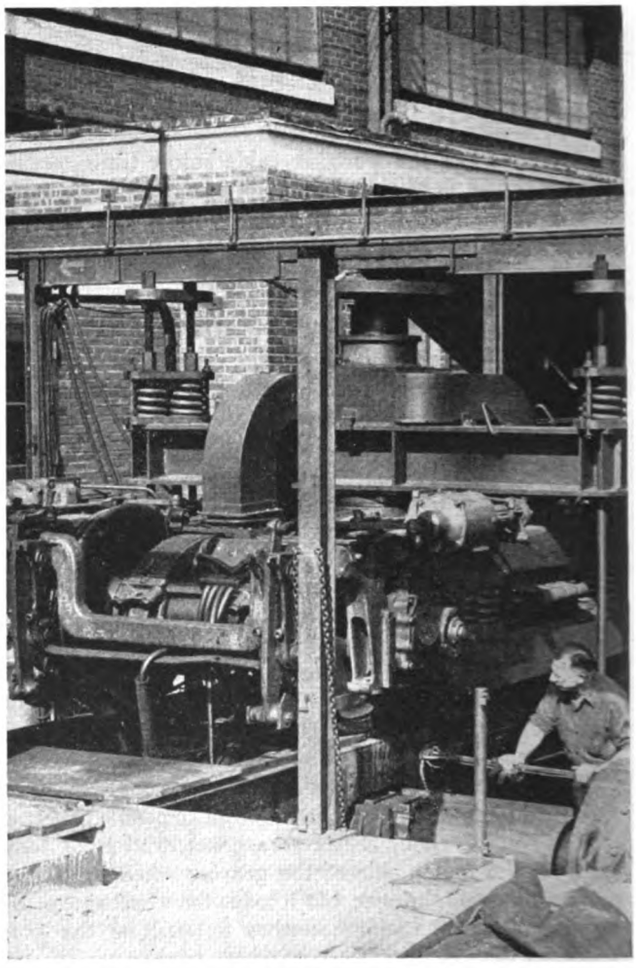
The new taper ground railway pinions are produced on a generating-type involute grinding machine which grinds both sides of the tooth space simultaneously. The taper is gotten by two angular adjustments. The first is a slight inclination of the line of travel of the grinding wheel, so that the wheel cuts deeper on the motor side of the pinion, thus cutting a tooth having a uniform taper across the entire face width. The second adjustment is a setting causing the teeth to be cut on a very slight helix. This adds to the uniform taper on one side of the tooth, and subtracts from the taper on the other side. By these means, any desired combination of tapers can be manufactured.

On an actual pinion, although the taper is small, it may be observed visually on the top land of the teeth. Of course, it is impossible, except by precision measurement, to ascertain what proportion of this taper is on the right side of the tooth and what proportion is on the left side.

By now, numerous observations of wear patterns have been made on locomotives using this new Heli-taper pinion. Minor adjustments in taper have been necessary to achieve 100 per cent face width contact on both sides of the teeth, although the tapers chosen for the first models from an analysis similar to that given above, were very nearly correct.

Figure 8A is a sketch of the type of wear pattern achieved with the Heli-taper pinion. This may be compared with the pattern of Fig. 8B for a pinion of uniformly tapered teeth, where it is easily seen that there is under-correction on the right side and over-correction on the left side.

A conservative estimate of the benefits to be gained from the Heli-taper pinion is that axle gear life will be tripled over the life previously obtained with straight ground pinions. Pinion breakage should be reduced to a bare minimum and the life of the pinions will in almost all cases be terminated by wear rather than by other causes.



An outdoor torture pit for testing new traction motor designs is helping engineers at the General Electric Company's Locomotive and Car Equipment Department at Erie, Pa., solve motor performance problems without having to test equipment on a locomotive. The motors are mounted in a locomotive truck and are put through all types of operating tests. A sequence timer, which automatically controls speed and power, subjects the motors to a 24-hr-a-day cycle simulating a typical locomotive run. This grueling operation shortens the time required to perfect new traction motor designs.

Passenger train hauled by one of the present Class GG1 locomotives used in New York-Washington and New York-Harrisburg, Pa. service.

PRR Seeks to Improve Motive Power

■ The Pennsylvania is now in the midst of a study to determine how to improve and better utilize the various types of motive power now in the service of this railroad. The study is being made jointly by the Pennsylvania, with the General Electric Company and the Westinghouse Electric Corporation, and with the firm of Gibbs and Hill, consulting engineers, acting as a catalytic agency to coordinate all phases of the work.

The primary purposes of the study are to determine the possibilities of developing improved electric freight and passenger locomotives, and in determining the potentialities of a combination diesel-electric locomotive which can operate both as a diesel locomotive and as a straight electric locomotive obtaining power from an overhead contact system.

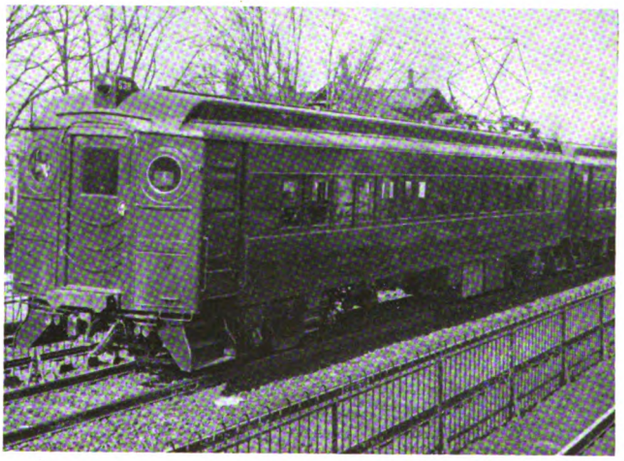
In addition to this, the Pennsylvania is exploring the possibilities of a high-speed multiple-unit car for the "Clocker" trains which run between New York and Philadelphia, Pa., and for service between New York and Washington, D. C. Another part of the study includes an m-u car which may be used more economically than those now in suburban service.

The study also is investigating the PRR passenger train operation on the New York and Long Branch to determine if the answer might be electrification, or a substitution of diesel locomotives for steam in the Long Branch territory.

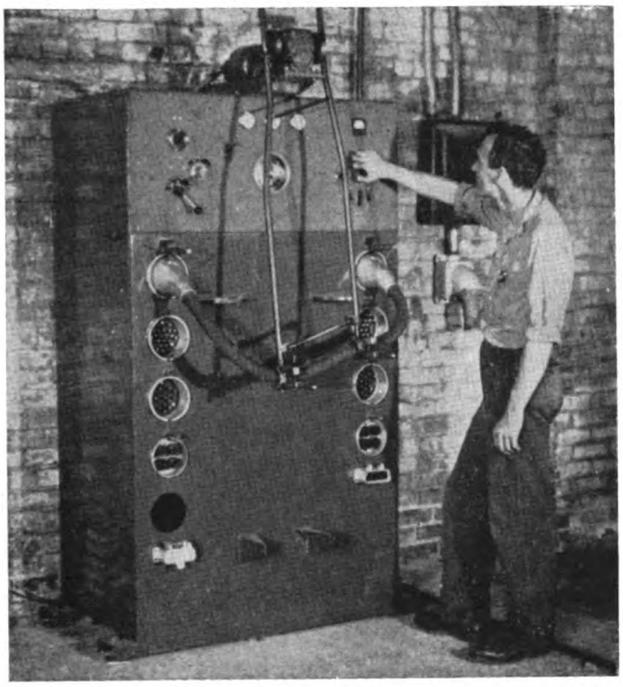
Previous electrification studies made in 1947 have indicated that the Middle Division, Harrisburg, Pa., and Enola, Pa., to Altoona, Pa., might be operated electrically without any great increase in motive power.

Accordingly, the present study will determine whether or not the economics of such an arrangement would release sufficient diesel power to postpone the purchase of additional diesel locomotives for use in the territory west of Altoona, Pa.

Improved freight locomotives are an objective of the study.

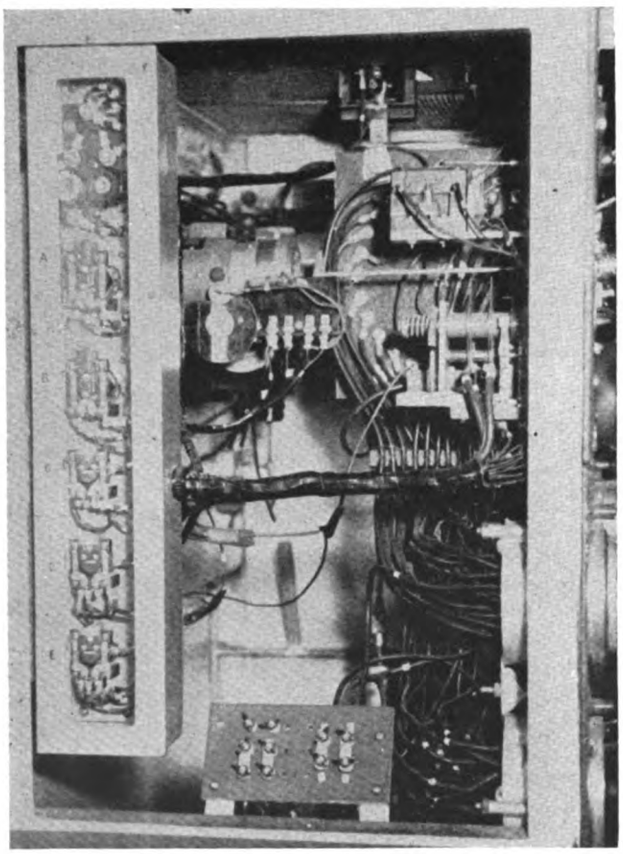


A more economical type of m-u car is being considered, to replace these now in service in the suburban areas.

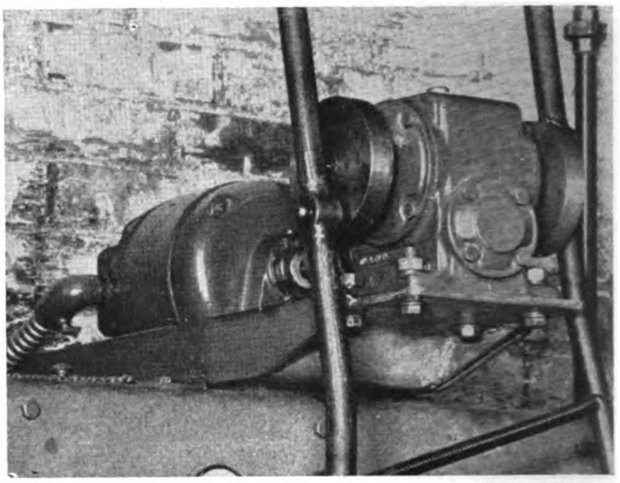


Walter Weitzel, who operates the machine, makes a current setting.

Automatic Jumper Tester



A panel removed from the left side shows location of relays at left. Connection straps at bottom make correction for reversed contacts, permitting automatic sequence operation.



The driving mechanism insures a positive back and forth movement of the cable.

■ A jumper tester developed on the Great Northern is unique in that once a test is started, the machine automatically runs the test from one conductor to another, until all are tested. If the machine finds a fault, the progression stops, and an alarm is sounded.

The machine makes current capacity tests, insulation tests, indicates sequence of conductors and shows short circuits or grounds. It is suitable for 27-, 21- and 16-pole locomotive jumpers or any combination of these and also for train control and electric brake jumpers.

During tests, the cables are bent back and forth by two oscillating arms which are secured to the cable by ratchet clamps about 12 in. apart, near the center of the cable. The arms are driven by two cranks 180 deg. apart to produce a 4½-in. stroke, at 36 oscillations per minute. A motor and gear box drive the cranks.

The machine operates from a 120-volt, a-c power source and 800 volts for the insulation test is obtained from a step-up transformer while 24 volts for the current test is supplied by a current transformer.

For the continuity and current-carrying test, the lever at the lower left of the control panel, is set on 24 volts, and the timer just above and to the right of the first lever, is set at 15 seconds. The current, by means of the rheostat at the right is set at 50 amp. The machine is then started and at the end of the 15-second period, the dropping out of the timer relay energizes a coil which pushes a ratchet, advancing the switch to the next pole. As it moves from one pole toward the next, the circuit breaker drops out and when it contacts the next pole, the circuit breaker closes. If all circuits are in good condition, this operation continues until all circuits are tested.

In case of an open circuit, a relay opens the circuit breaker which stops the timer and sounds a buzzer until the operator resets the machine. The timer is motor-driven and the timer setting on the panel controls the motor speed. On this, test current flows from the source to the circuit breaker, to the dial switch, to a jumper pole and from the other end of the jumper pole back to the source.

For the high-potential test, 800 volts is applied in sequence to the terminals. If a short occurs, the circuit breaker kicks out and the buzzer sounds. The reset button must then be used to restart the sequence. Progression may be made manually if desired.

The tester was designed and built by Sam Brice, Electrician, G. N. Shops, Hillyard, Washington.

From the Diesel Maintainer's Note Book

The Fire That Wouldn't Go Out

By Gordon Taylor

■ A GP-7 unit was dispatched for service on a work train with everything apparently working okay. Along the line a fire in a field had spread to weeds on the right-of-way. As the work train passed this area, the fire was so close that it ignited oil on the side and bottom of the fuel tank. The crew immediately stopped the train and used the fire extinguishers on the locomotive, but were unable to extinguish the fire.

It then became necessary to run the locomotive to a small town about a mile away, where the flame was extinguished by the local fire department. There seemed to be no damage, but some scorched paint on the fuel tank.

Such fires usually can be extinguished by the extinguishers on the locomotive, but in this case there seemed to be some unexplainable reason why the flame would not go out. The unit had been thoroughly cleaned up and it was supposed that all of the grease on and around the fuel tank had been washed away before the unit was dispatched for service.

For several days no one could explain why the fuel tank had become oily and why the fire persisted in burning after attempts had been made to extinguish it. Several possible reasons were given as explanations, but none of them seemed to be reasonable.

Finally, it was discovered that a $\frac{3}{8}$-in. copper tube line, which is known as the fuel vent and return line, connected with the fuel level gage on the side of the locomotive, was broken in such a manner that a small quantity of fuel was leaking out in this line down on top of the fuel tank.

When there is a fuel oil tank on a diesel locomotive that persists in remaining covered with oil, it is necessary to examine the fuel line referred to. This location is very difficult to get to in making repairs, and it is usually necessary to drop one of the air reservoirs from the locomotive to enable the pipefitter to reach over the end of the fuel tank to make the necessary repairs. Where possible, this fuel line should be braced or supported in some manner to eliminate vibration.

This series of articles is based on actual experiences ot men who operate and maintain diesel-electric locomotives.

A Step Nearer an Atomic Locomotive

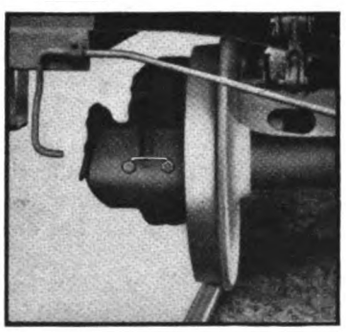
■ Two General Electric engineers have proposed an atomic reactor design which promises to remove many obstacles to the use of atomic power plants in airplanes, locomotives and ships.

The design more than halves the weight per horsepower of conventional atomic reactors and eliminates many moving parts that are standard in such equipment. It is a liquid sodium reactor, and most of the weight and bulk of the conventional reactor is eliminated by nesting the reactor inside a cylindrical heat exchanger.

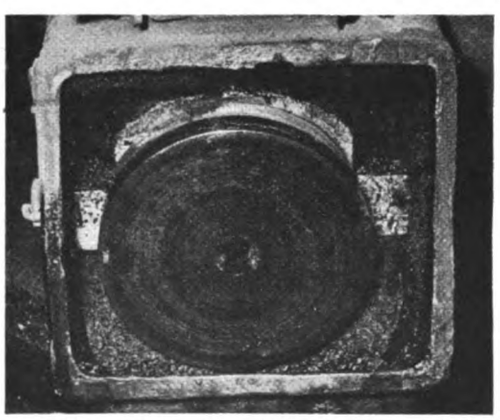
This arrangement eliminates the separate heat exchanger used to convert water into steam to drive turbine-generators. It also eliminates much piping, valves and open space which must be shielded to protect personnel from radiation.

The space saving and simplification of the reactor are achieved in the G-E design through use of electrical energy generated by temperature differences in the heat exchanger. It is comtemplated that this source of power can be used directly to pump the liquid metal coolant.

Here's how Magnus improve freight



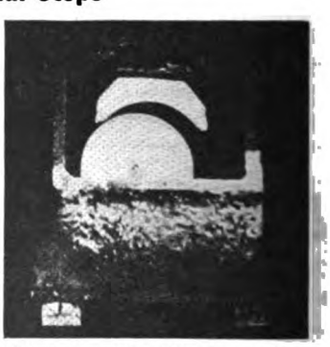
100 50'-6" Frisco box cars like the above are equipped with R-S Journal Stops. Inset shows end view of truck and hex-head bolts that secure the stops. Frisco box cars, series 7000 to 7099, were equipped with R-S Journal Stops as a result of extensive tests on 9 additional cars that established improved performance and maintenance savings.



Journal box with R-S Journal Stops after flat switching impact at 11½ mph. Packing is still in proper position. Compare with photos at right.

This CAN'T HAPPEN when you use R-S Journal Stops

Photo of journal box at impact of 6 mph, showing how bearing is cocked off journal and packing is displaced.



When air and hand brakes are both applied, bearing and entire box are raised, compressing packing.

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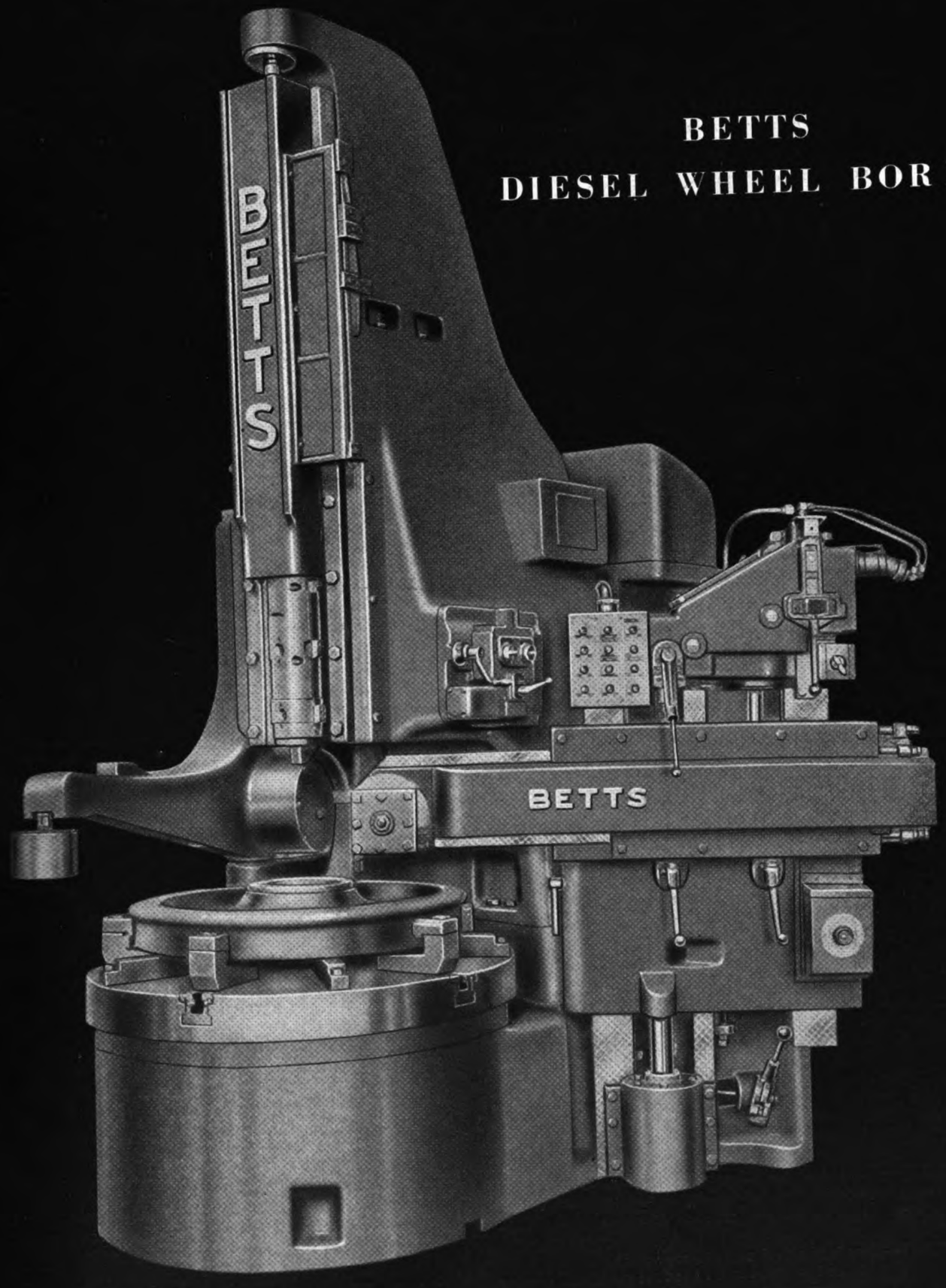
DIESEL WHEEL BORER



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Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Fuel Flow *(continued)*

G224-Q—What would show a normal situation?
A—Normally, a small amount of fuel will leak by the plunger and come out the small hole in the stand pipe of the by-pass sight glass.

G225-Q—What would indicate abnormal leakage?
A—When the leakage is sufficient that the fuel flows out of the top of the sand pipe. This fact should be reported to the maintenance force.

G226-Q—What check should be made if no fuel is flowing through the fuel return sight glass?
A—In this event, check fuel pump motors and fuel pumps.

G227-Q—Suppose that pumps in all units are stopped?
A—In this case, check PC switch and fuel pump fuse in distribution panel.

G228-Q—When making this check what precaution must be observed?
A—Do not confuse fuel pump fuse and fuel pump motor fuse.

G229-Q—What should be checked in case of a fuel failure, if pumps on other are running?
A—Check switch on engine control panel and control switch, 80 ampere and fuel pump motor fuse in the distribution panel of the unit affected.

G230-Q—Suppose that fuel pump is running but no fuel is being pumped?
A—In that case, check fuel supply, emergency fuel cut-off under the unit, or check for a suction leak in piping between tank and pump, also check for broken or slipping coupling at the fuel pump.

Engine Speed and Fuel Indicators

G231-Q—How many pointers are on the cover of the governor?
A—Two.

G232-Q—What does one of these pointers indicate and how is it labeled?
A—One of these two pointers indicates the throttle position of the engine and is labeled SPEED.

G233-Q—What does the other pointer indicate?
A—The second pointer indicates the position of the power piston in 16ths of an inch and is labeled FUEL.

G234-Q—How is the fuel scale interpreted?
A—The lower the number on the fuel scale, the greater the quantity of fuel which is being injected into the cylinder.

G235-Q—How should the fuel indicator pointer read in No. 8 throttle (speed) position?
A—The pointer should indicate between 5 and 6 if the engine is properly loaded.

Filling Fuel Tanks

G236-Q—Can the fuel tanks be filled from either side of locomotive?
A—Yes.

G237-Q—What is there to indicate the level of fuel oil?
A—Direct reading sight level gauges located on each side of the fuel tank adjoining the fuel fillers, indicating the level of fuel oil starting at 4½ inches from the top of the tank, and should be observed while filling the tank to prevent overflowing.

G238-Q—What should be done with the fuel oil before it enters the tank?
A—It should be filtered through a reliable fuel filter before it enters the tank.

G239-Q—What precaution must always be observed when handling fuel oil?
A—Never handle fuel oil near an open flame.

Fuel Gauge

G240-Q—Describe the fuel gauge.
A—This is a direct reading, air operated gauge, located on the engine control and instrument panel, which indicates the quantity of fuel in the fuel tank.

G241-Q—Does the gauge show fuel level continuously?
A—No. A push button needle valve directly below the fuel gauge, must be pushed in to get the fuel level indication on the gauge.

Emergency Fuel Cut-Off Valve

G242-Q—What is the function of the Emergency Fuel Cut-Off Valve?
A—To cut off the fuel supply to the fuel pump in the event of fire or any other emergency.

(Manual 2310, page 408)

G243-Q—Where is it located?
A—It is located in the center of the underside of the fuel tank inside a valve compartment on which is a sliding cover.

G244-Q—Describe the arrangement further.
A—On each side of the locomotive, both A and B units, attached to the side skirt, is a small box with a lift cover. Enclosed in this box is a pull ring on the end of the cable running to the fuel cut-off valve.

G245-Q—Where are similar pull rings located?
A—A similar ring is located in the operating cab of each A unit, and one on the engine room wall at the governor end of the engine in each B unit.

G246-Q—What is the purpose of the pull rings?

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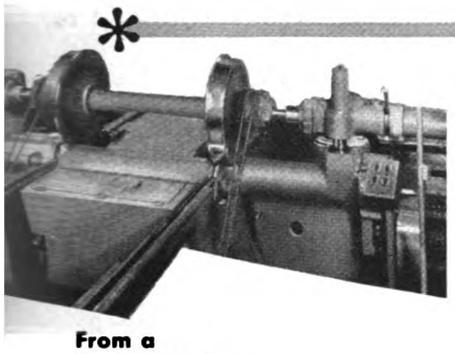

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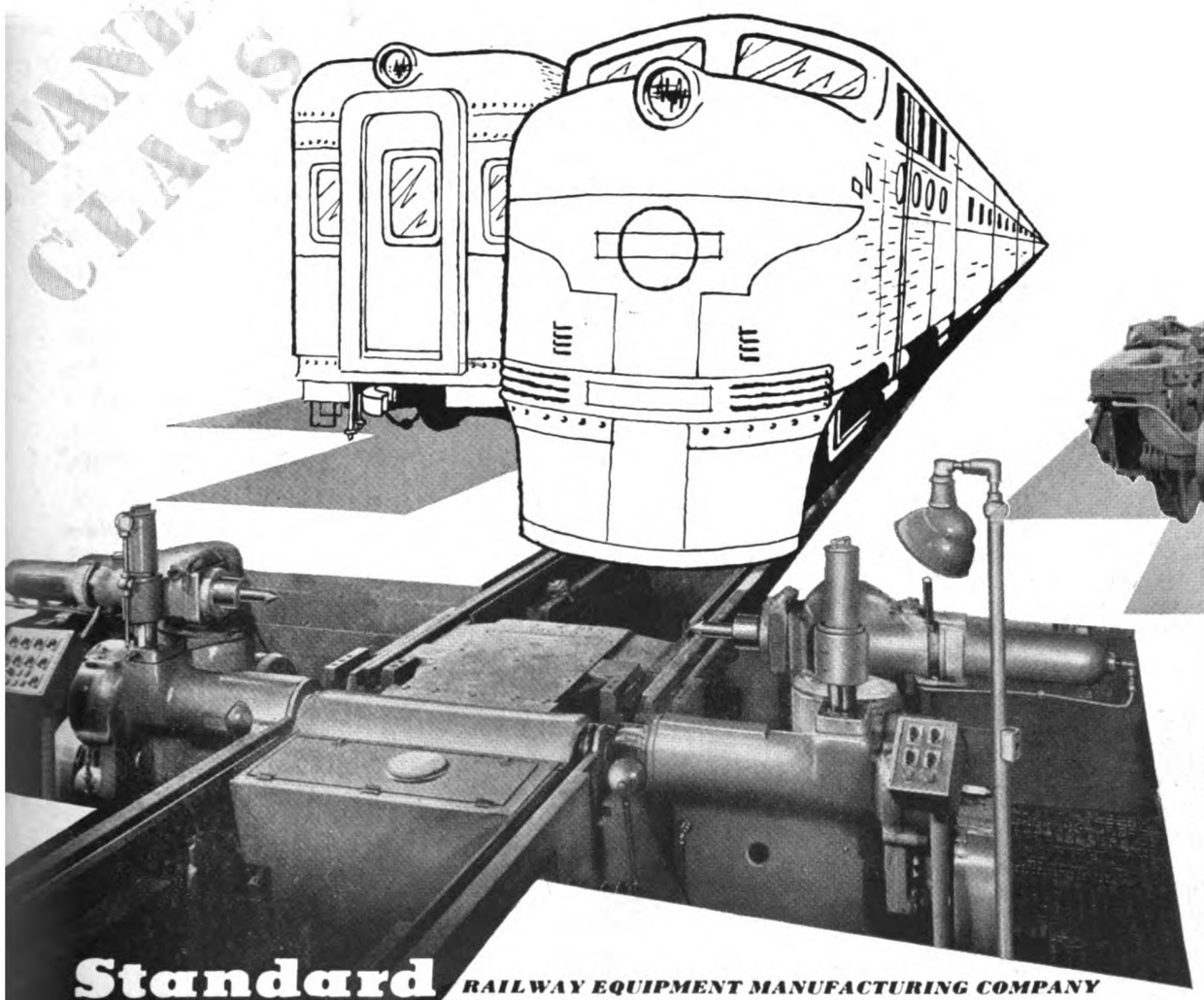

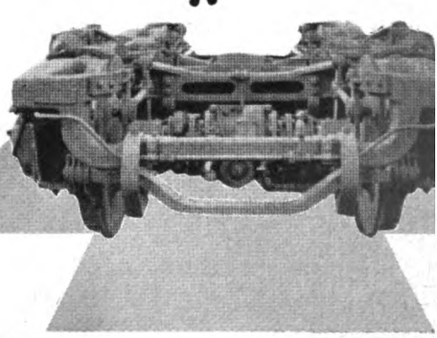

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Standard *Railway Equipment Manufacturing Co., (Canada) Ltd.*

Sun Life Building, Montreal

A—The fuel cut-off valve can be tripped and the fuel then cut off by pulling any one of these rings.

G247-Q—If tripped, do the valves reset automatically?
A—No, if tripped the valve underneath the fuel tank must be reset manually.

G248-Q—How is the valve reset?
A—To reset: Crawl under locomotive fuel tank and slide valve compartment to one side. Pull valve stem out and set yoke in place to hold valve open. Close compartment cover.

Electrical Equipment

(Manual 2310, page 300)

General Electrical Scheme

G249-Q—What is the relation of the engine to the main generator?
A—In full throttle, the rated horsepower of the engine is delivered to the direct coupled generator.

G250-Q—What takes place at the main generator?
A—At the main generator the power of the engine is transformed into electrical power.

G251-Q—How is this power then utilized?
A—The electrical power is then conducted to the four traction motors, two motors being located in each truck.

G252-Q—How is the power as conducted to the motors used?
A—Each motor is geared to a locomotive axle.

G253-Q—Does the power (KW) delivered to the traction motors at full throttle vary according to the engine speed?
A—The locomotive is designed so that the current and voltage limits of the main generator, that the power delivered to the traction motors at full throttle is the same, regardless of the locomotive speed.

G254-Q—How can the electrical system of the locomotive be thought of as being divided?
A—Into three separate systems: 1 High voltage (includes dynamic braking if used; 2 Low voltage system; 3 Alternating current system.

G255-Q—In what way is the high voltage system concerned?
A—The high voltage system is directly concerned with moving the locomotive; or in retarding the locomotive in case dynamic brakes are supplied and are in use.

G256-Q—What are the main components of the high voltage system?
A—Main generator, traction motors, forward and backward transition relays, shunt field contactor, motor shunting contactors, reverse drum, wheel slip relays, ground relay and parallel power contactors.

G257-Q—On locomotives equipped with dynamic brakes, what else may be considered to be in the high voltage system?
A—The cam switch, braking contactors and brake grids.

G258-Q—In what way is the low voltage system related to the electrical system?

(Manual 2310, page 302)

A—The low voltage system contains the control circuits which control the flow of power in the high voltage system, and those auxiliary circuits conducting power to the locomotive lights, heater fans, fuel pump and the main generator battery field.

Fairbanks-Morse
Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Summary of Correct Governor-Load Regulator Settings

Load Regulator Timing

F208-Q—What should be the timing with warm oil?
A—Five seconds, minimum to maximum; ten seconds. maximum to minimum.

F209-Q—What should the timing be with cold oil?
A—Seven seconds, minimum to maximum; 15 seconds. maximum to minimum.

Governor Power Piston Gap

F210-Q—What should the gap be at full load?
A—The gap should be $\frac{3}{8}$ inch.

F211-Q—What should the gap be at IDLE?
A—The gap at IDLE should be $\frac{6}{64}$ inch.

F212-Q—What are the corresponding fuel pump readings?
A—8CS, 8OCs, 16 total.

F213-Q—What would be the position of the load regulator at Locomotive start?
A—In minimum field, i.e. load regulator in minimum field with throttle in IDLE.

Fuel Oil System

(Bulletin 1706—116-A, page 1-2)

F214-Q—Referring to illustration 1 (page 2), where does the fuel originate?
A—The 1,200 gallon fuel supply tank underneath the locomotive.

F215-Q—Where does the fuel oil go, from the tank?
A—The fuel transfer pump draws fuel from the tank through an emergency fuel cut-off valve and through a fuel suction strainer.

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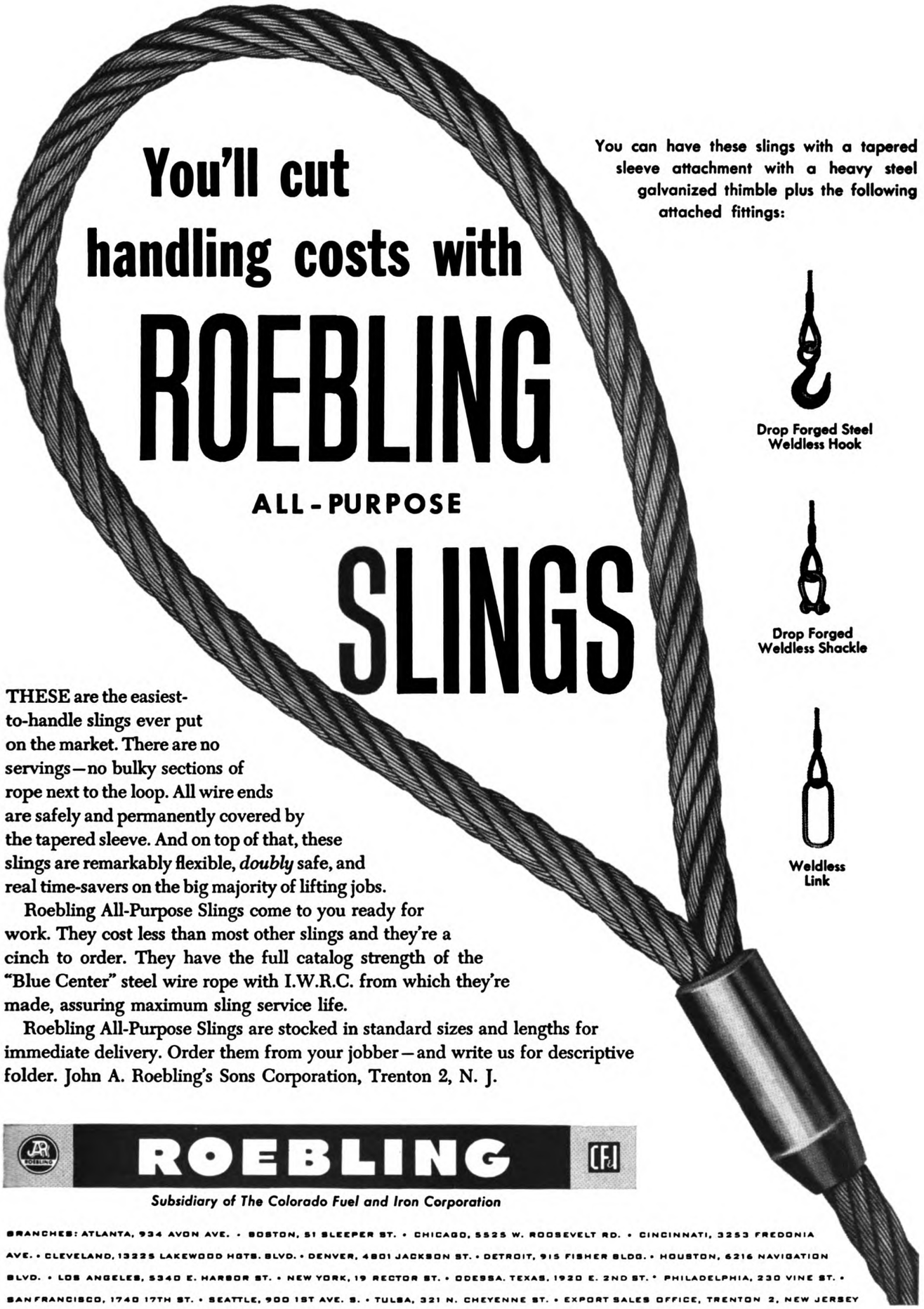

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F216-Q—Where does the fuel oil flow to after passing through the fuel transfer pump?
A—Through a pressure relief valve in the transfer pump discharge line and through a fuel pressure filter to the engine fuel headers.

F217-Q—What is the function of the pressure relief valve?
A—To by-pass fuel back to the tank in the event of a clogged pressure filter. The relief valve is set for approximately 40 pounds.

F218-Q—What is used to indicate pressure supplied to engine fuel header?
A—A fuel pressure gage, mounted at engine control panel.

F219-Q—What do the fuel headers supply?
A—The engine fuel pumps and nozzles. There is a relief valve at header outlet.

F220-Q—What is the purpose of the fuel return headers?
A—To pass excess clean fuel back to fuel tank.

F221-Q—How is the fuel tank filled and what precautions should be taken?
A—Filling is from either side of locomotive at a rate of 250 gallons per minute. Fuel should be filtered before it enters the tank and should not be handled near an open flame.

(Bulletin 1706—116-A, page 3)

F222-Q—How is the fuel tank drainage provided for?
A—There are two drain plugs at either end for draining the tank and a plug at the bottom of the sump for draining any water. Both tanks should be drained periodically for water and sediment.

F223-Q—What should be done during freezing weather?
A—It is advisable to put about five gallons of alcohol in the fuel tank during freezing weather, to settle in the sump and prevent water from freezing. Under severe conditions more alcohol may be added for the tank itself.

F224-Q—Describe the tank vents.
A—There are two vents, one on each side, terminating above the tank, equipped with four in. flame arrestors.

F225-Q—What is the purpose of the auxiliary line tapped into the main suction line, between the emergency cut off valve and the fuel pump?
A—This is the supply line to the steam generator (on passenger units).

F226-Q—What is the reason for having a relief valve at the header inlet?
A—More fuel is pumped through the injection system than is needed, and the relief valve maintains a pressure of 15 lbs at the header outlet.

F227-Q—What becomes of the excess lubricating oil from the injection push rod lubrication, also fuel oil leaking from the injection tube connections?
A—As it collects in the injection nozzle compartment, it is piped to a drain to the ground at the right corner of the fuel tank.

F228-Q—What is a must, in regard to fuel supplied?
A—Fuel must be clean to avoid trouble in the system.

F229-Q—What should be the fuel pressure at full engine speed?
A—Approximately 20 to 25 pounds.

F230-Q—What may be the cause, if the pump runs and this pressure does not show?
A—The cause may be no fuel in tank, emergency cut off valve tripped, leaks in fuel suction line, clogged suction strainer, worn pump packing rings, pump relief valve sticking or clogged pressure filter.

F231-Q—What takes place if a tube between the injection pump and nozzle should break or loosen?
A—The escaping fuel will be carried away in the waste fuel drain.

F232-Q—What must be done if this happens?
A—The pump having the defective tube should be cut out (as shown in illustration 3, page 5, section 116-A).

F233-Q—Describe this operation.
A—Pull out the control rod plunger and at the same time push the control rack assembly as far as possible to the right so that the plunger end no longer engages in the slotted end of the rack. The pin can be released and the pump will no longer deliver fuel.

F234-Q—What should be the limit as to the number of pumps cut out at one time?
A—Four pumps on a 10 or 12 cylinder engine. Two pumps on an 8 cylinder engine and then only long enough to get to a maintenance point.

(Bulletin 1706—116-A, page 6)

F235-Q—How may an irregular operation be detected?
A—A cylinder not receiving fuel or not firing can be detected by the irregular sound of the engine. Likewise, any cylinder getting excessive fuel due to defective nozzle can be detected. Any pump not functioning properly should be cut out.

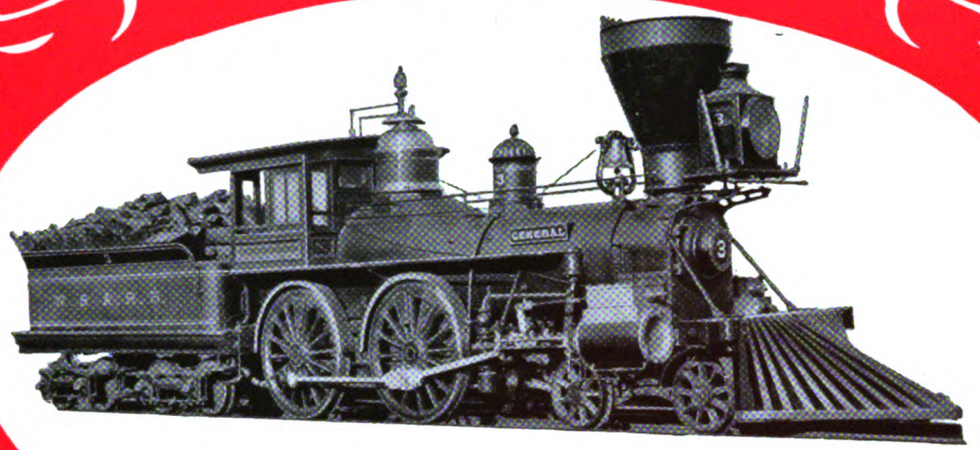
Lubricating Oil System

(Bulletin 1706—117-A, page 1)

F236-Q—How does the lubricating oil system function?
A—The lubricating oil system serves a dual purpose by furnishing oil to the engine for cooling the pistons and lubricating the various bearings and wearing parts under pump pressure.

F237-Q—Describe the flow of lubricating oil.
A—The engine driven lubricating oil pump draws oil from the engine crank case through a coarse strainer, and pumps it through a 6 element filter to the oil cooler. Here, the oil is circulated around water cooled tubes and then piped through a strainer to the engine oil headers. Flow continues through the engine parts and back to the crank case.

F238-Q—How does the oil flow at idling speed?
A—The design is such that at idling speed all oil flows through the 6 element filter.



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Supply Trade Notes

(*Continued from page 12*)

land. The laboratories will engage in basic, exploratory work, mainly on solid state physics research in the broad abstract sense as well as the practical investigation and design of materials to meet future requirements of industry. *Dr. Robert G. Breckenridge* will head the plant.

■

AMERICAN BRAKE SHOE COMPANY, BRAKE SHOE & CASTINGS DIVISION.—*Fred P. Biggs*, division president, has been named to the new position of division chairman. *Stephen S. Conway*, first vice-president, sales, has been appointed division president and chief executive officer. *John F. Ducey, Jr.*, vice-president, has succeeded Mr. Conway as sales vice-president, and *Sam R. Watkins*, formerly executive vice-president, National Bearing Division, has been named to the new position of BS&C division vice-president, railroad sales.

Harry C. Platt, vice-president, production, of Brake Shoe's Engineered Castings Division, has been appointed president of that division, succeeding N. G. Belury, recently appointed sales vice-president for the American Brake Shoe Company.

■

PENNSYLVANIA SALT MANUFACTURING COMPANY.—*Hugh C. Land*, manager of manufacturing of the Industrial Chemicals Division, has been appointed general manager of that division, in charge of production and sales. He succeeds *William P. Drake*, recently named executive vice-president.

■

SCHAEFER EQUIPMENT COMPANY.—*Frederic M. Schaefer*, executive vice-president, has been elected president, succeeding to the position held by his late father, *Frederic Schaefer*.

■

GOULD - NATIONAL BATTERIES. — *George P. Millington*, district manager at Philadelphia, has been appointed Atlantic regional manager of the industrial division, with headquarters at Philadelphia.

■

FAIRBANKS, MORSE & CO.—Sales and service headquarters for Connecticut, New York, New Jersey, Eastern Pennsylvania, Maryland, Delaware and Virginia have been opened at Fair Lawn, N. J., replacing domestic and export sales offices and a scale service shop, formerly located in New York, and the warehouse and shipping center, formerly located in Philadelphia. The Railroad Division office remains at 230 Park avenue, New York. Among those now headquartered at Fair Lawn are *F. C. Johnson*, manager; *C. N. Malone*, assistant manager; *R. J. Bouffard*, manager diesel sales; *C. C. Libby*, manager electrical sales, and *M. O. Anderson*, manager repair and service department.

■

FAIRBANKS, MORSE & CO.—*John C. Elmburg*, manager of Fairbanks, Morse's Portland, Ore., branch, has been appointed assistant general sales manager, effective July 1, upon retirement of *Harry L. Hilleary*. *William F. Wahlenmair*, electrical department manager, has been named to succeed Mr. Elmburg as Portland branch manager.

Stephen S. Conway

Pach Bros.

John F. Ducey, Jr.

Sam R. Watkins

Harry C. Platt

Stepped up research and testing activities of the Southern Pacific have been centralized in the newly created Department of Research and Mechanical Standards described on page 57 of this issue. Enlarged and modernized, the laboratory shown here serves as the center for chemical and physical analyses for SP lines west of El Paso. Laboratories at other points will be primarily concerned with testing diesel locomotive parts, fuels and lubricants.

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SUPPLY TRADE NOTES

(*Continued from page 102*)

INTERNATIONAL NICKEL COMPANY.—A new plating laboratory, the main feature of which is said to be the world's only fully automatic pilot plating plant, was unveiled April 14 at the Bayonne, N. J., Research Laboratory of International Nickel. This pilot plant permits the testing of new plating processes and metallic coatings under conditions virtually similar to those existing in actual plating plants.

At the same time, the company announced development of three new products—two welding electrodes and a special, corrosion-resistant high nickel alloy. One of the new electrodes, Inco-Rod A, a multipurpose rod, is expected to reduce substantially electrode inventories in the average plant. The other, No. 132 Inconel electrode, welds Inconel to itself. The third product, Nionel, is a versatile high nickel alloy capable of resisting corrosive attack by a large number of hot acids and mixtures of acids.

■

NATIONAL MOTOR BEARING COMPANY.—*William G. Ringland*, formerly with the New York Central, has affiliated with National Motor Bearing as eastern district manager of the Railroad Equipment Division, at New York.

■

ELECTRIC STORAGE BATTERY COMPANY.—*H. H. Warren*, assistant manager of the New York sales office, has been appointed assistant sales manager of Exide Industrial Division, at Philadelphia.

■

PYLE-NATIONAL COMPANY.—*William C. Croft*, executive vice-president, has been elected president and a director. *Harold V. Engh*, whom Mr. Croft succeeds as president, asked to be relieved of his duties as chief executive officer, but will continue as a director.

A. E. Ganzert, formerly chief engineer of Mars Signal Light Company, has been appointed consultant for Pyle-National.

■

DAYTON RUBBER COMPANY.—*William F. Moore* has been appointed representative for the southeast section for the Railway Division, with headquarters at 1055-59 Spring street, N.W., Atlanta, Ga. Mr. Moore was formerly associated with the Unistrut Products Company, Chicago, and Continental Tooling Service, Inc., Dayton, Ohio.

P. R. Keller

T. R. Wagner

■

BUDD COMPANY.—*Percy R. Keller*, assistant general sales manager, has been elected vice-president—railway sales, Eastern region, at Philadelphia. *Thomas R. Wagner*, regional sales manager at Chicago, has been elected vice-president—railway sales, Western region, with headquarters in Chicago.

■

HARNISCHFEGER CORPORATION.—*Odis Small, Jr.*, has been appointed railroad sales manager. Mr. Small was formerly associated with the Electro-Motive Division of the General Motors Corporation.

■

WILLSON PRODUCTS, INC.—RAYO-O-VAC COMPANY.—Willson Products, has been purchased by Ray-O-Vac. *J. Clyde Ryan*, executive vice-president of the latter company, has been elected president and general manager of Willson Products, succeeding *Thomas A. Willson*, elected chairman of the board.

■

WESTINGHOUSE AIR BRAKE COMPANY.—*Oscar Bergman*, service engineer for the southeastern district of the Air Brake Division, has been appointed representative for the same district, with headquarters at Washington, D. C.

W. G. Ringland

MAGNAFLUX CORPORATION.—*Roy O. Schiebel* has been appointed sales manager at Chicago, succeeding *Lloyd J. Oye*, resigned. *Robert G. Strother* has been appointed Eastern Region manager; *Kermit A. Skeie* succeeds Mr. Strother as Western Region manager in Los Angeles, and *Denis P. Walsh*, assistant to the vice-president, succeeds Mr. Skeie in Chicago as manager of the Central Region.

Mr. Schiebel became Los Angeles branch manager in 1942. After the war, in 1945, he returned to Chicago as midwest district

(*Continued on page 108*)

W. F. Moore

O. Bergman

Odis Small, Jr.

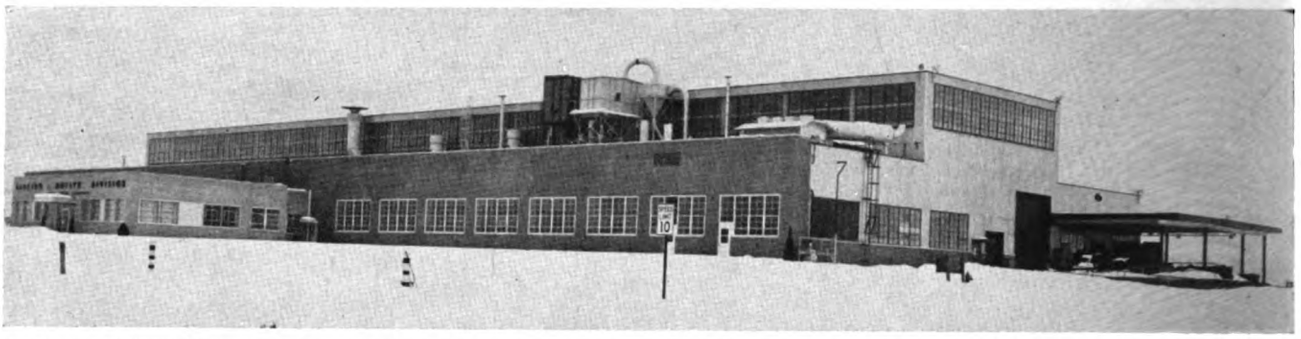
Always an operating hazard—and a constant drain on the maintenance budget—rust is a doubly dangerous enemy now when it is difficult to obtain metal replacements.

RUST-OLEUM stops rust effectively—is the practical answer to many railroad rust problems. Its tough, pliable, rust-resisting film gives excellent protection to bridges, rolling stock, metal buildings, signal equipment, tanks and many other rustable metal surfaces.

CUT YOUR MAINTENANCE COSTS

RUST-OLEUM cuts maintenance costs in two ways. (1) It prevents rust on new rustable metal surfaces so that costly replacements can be deferred longer than previously could be expected. (2) Because RUST-OLEUM can be applied *even* over metal already rusted—usually without sandblasting or the use of chemical rust removers—it saves many, many man hours. *Write for your copy of the NEW RUST-OLEUM Railroad Catalog.*

RUST-OLEUM CORPORATION
2592 Oakton Street, Evanston, Illinois



NEW BRANCH PLANT opened by the Electro-Motive Division of General Motors Corporation at North Salt Lake, Utah, April 13, provides 54,000 sq ft of floor space. It will be used as a parts distribution center and for re-manufacturing, to "new component" standards, by original factory production-line methods, diesel engines, traction motors, generators and control apparatus

SUPPLY TRADE NOTES

(continued from page 104)

manager. In 1952 he was transferred to New York as eastern district and export manager.

■

KLASING HAND BRAKE COMPANY.—The Industrial Sales Division of *Sears, Roebuck & Co.* has been appointed to handle national sales of Klasing hand brakes.

■

KOPPERS COMPANY, WOOD PRESERVING DIVISION.—*Thomas J. McGinnis*, assistant to general manager, has been named manager of the Pittsburgh district. He has been succeeded by *Ralph H. Bescher.*

■

PAXTON-MITCHELL COMPANY.—*Stephen P. Murphy* has been appointed district manager, succeeding *Howard W. Dillon*, retired. Mr. Murphy was formerly associated with Illinois Electric Porcelain Company.

■

GENERAL MILLS CORPORATION, O-CEL-O DIVISION. — *Railroad Supply & Equipment, Inc.*, Clarks Summit, Pa., has been appointed sales, engineering and service representative for O-Cel-O cellulose sponge journal box packing.

■

FRANKLIN BALMAR CORPORATION. —*John N. Merkle*, president, has been elected vice-chairman of the board, and has been succeeded by *Julius J. Kirchhof*, executive vice-president.

■

SCULLIN STEEL COMPANY.—*Thomas W. Pettus* has been elected executive vice-president. Mr. Pettus was formerly vice-president of American Brake Shoe Company and was recently assigned to overall railroad sales.

■

VAPOR CAR HEATING COMPANY, LTD.—*George F. Shaw* has been transferred from Montreal to Winnipeg; *William J. Burrows* has been transferred to Montreal from Winnipeg, and *Leonard J. Holmes* has become associated with Vapor at Montreal. In the respective areas each will sell and service Vapor-Clarkson steam generators and heating systems and controls.

■

UNION CARBIDE & CARBON CORP.—*Dr. Augustus B. Kinzel* has been elected vice-president — research, succeeding *Dr. George O. Curme, Jr.*, who is retiring.

Dr. Kinzel joined the Electro Metallurgical Company as a research metallurgist in 1926. He became chief metallurgist of the Laboratories in 1931, and a vice-president of the company in 1944. He was appointed director of research of Union Carbide & Carbon in July 1954.

Obituary

LELAND J. LYTLE, 58, district sales manager of Barco Manufacturing Company, Shaker Heights (Cleveland), Ohio, died April 13.

■

STANLEY E. GILLESPIE, retired president of Western Railroad Supply Company, died April 29 at Skokie, Ill.

EQUIPMENT... *New Ideas—New Uses*

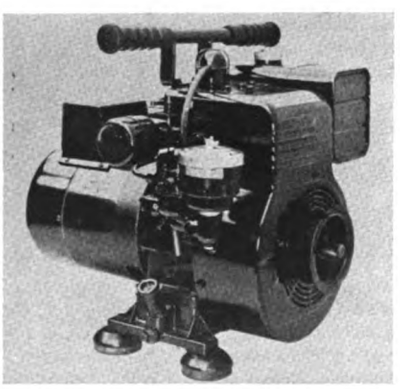
(Continued from page 28)

the same—one hr at 300 deg F or two hr at 250 deg F. An important feature is its thinner construction, now only 5 mils thick, making it useful where space is at a premium.

It is yellow in color and has a high dielectric strength of 1,500 volts and greater solvent resistance. Tensile strength is 45 lb per in. of tape width, insulation resistance is 10 megohms at 96 per cent relative humidity, and the electrolytic corrosion factor is 0.95. It is available in 60-yd rolls in standard widths. *Minnesota Mining & Manufacturing Co., 900 Fauquier Street, St. Paul 6.*

Portable Electric Plant

The Gen-A-Matic line of portable electric plants includes 22 models, ranging



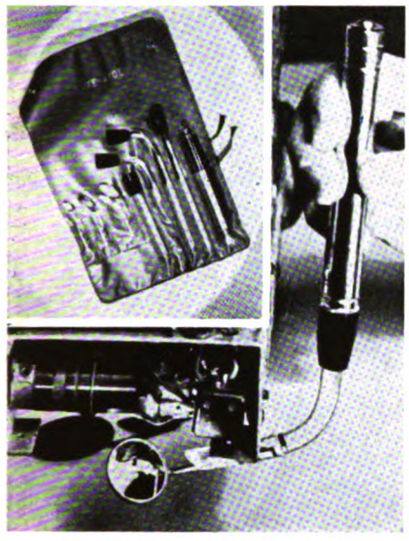
from 275 and 500 watts, 6 and 12 volts to 4,000 watts, 120-volt models. Both a-c and d-c models are available with operating speeds from 2,800 to 3,600 rpm.

Engines used to operate all models are ruggedly constructed 4-cycle units. Each unit is engineered for long, heavy-duty service, designed to give instant power whenever needed. They can be used as the sole source of power where central station service is not available; as protection against power failure; for operation of power tools on remote locations; and for auxiliary lighting. *Multi-Matic Corporation, 14741 Bessemer street, Van Nuys, Cal.*

Corrosion Penetrant

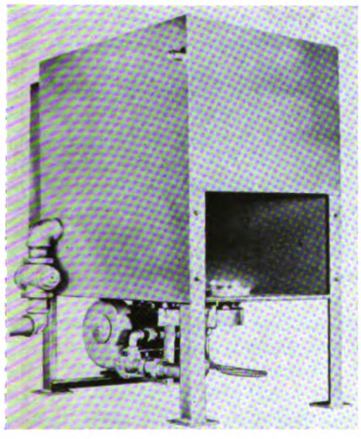
Corroded nuts and studs, and seized machinery parts can be loosened with this non-oily penetrant. The manufacturer claims that it is fast-acting and penetrates deeply. Puritan Penetrant is odorless and does not

spread over the work. Several minutes after its application, the work is tapped with a hammer and disassembled with the proper tools. The penetrant is supplied in containers from half-pint to 5-gal size. *Olin Mathieson Chemical Corporation, 10 Light street, Baltimore 3, Md.*



Inspection Kit

Inspection may be speeded and simplified with the Syte-Ayde which provides light in out-of-the-way places. Powered by flashlight batteries, the Syte-Ayde kit has four styles of light transmitting rods. The two straight rods are 3½-in. and 6-in. long. Of the same lengths, the other two are bent 90-deg. Three 1.5-power mirrors are supplied with clips that fit the rod ends. These mirrors have diameters of ½-in., ¾-in., and 1¼-in. All parts are contained in separate compartments of a plastic kit. *General Scientific Equipment Company. 2700 W. Huntingdon street, Philadelphia 32.*



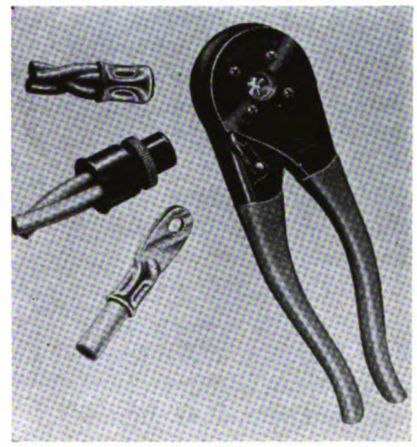
Gas-Fired Small Parts Washer

This compact small parts washer, said to be suited for use with commercial cleaning compounds, is fired by a gas-fired "Radiant Heat" system. It is available in three sizes—100,000, 129,000 and 158,000 Btu's per hr. The tank is of heavy gage welded steel construction with structural reinforcements. It holds approximately 50 gal, and is complete with an inclined trough for scum removal and an overflow drain outlet.

The unit is equipped with safety control and an automatic gas valve to supervise pilot operation and main gas supply. The manufacturer states that the temperature of the cleaning compound can be raised from 50 deg to 200 deg in approximately 1 hr. *Burdett Manufacturing Company, 3433 West Madison street, Chicago 24.*

Corrosion-Resistant Metal

Nionel is a high nickel alloy which with its molybdenum and copper content is resistant to hot sulphuric and phosphoric acid solutions. The chromium content is sufficient that the alloy also resists a wide variety of oxidizing chemicals. Nionel is approximately 40 per cent nickel, 21 per cent chromium, 3 per cent molybdenum, 1.75 per cent copper, 31 per cent iron and small amounts of manganese, silicon and carbon. The metal is recommended for handling acids, pickling solutions, bleaches and other corrosive liquids. *International Nickel Company, 71 Wall street, New York 5.*



Hand Operated Splicing Tool

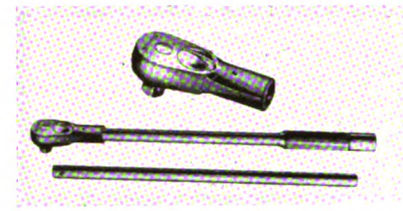
The standard type C-24 hand-operated splicing tool for splicing and terminating all circuit wiring work appears now in an improved lighter weight version. A 20 per cent reduction in tool head thickness plus a 20 per cent reduction in overall tool weight is said to result in better balance which permits the user to work with the tool for longer periods with less effort and fatigue.

Featuring a four-way crimping action, the device splices various combinations of stranded and/or solid wires from two No. 18's to three No. 8's or two No. 6's with two sizes of all-copper splice caps. Termend lugs of one barrel size are efficiently installed over a wide wire range of No. 16 through No. 8 inclusive. They are available in three tongue styles and in various stud sizes.

Vinyl insulators for splice caps offer fixed insulation protected for all splices. Open or closed and splice caps, vinyl insulators and termend lugs are UL and CSA approved. *Buchanan Electrical Products Corporation, Hillside, N.J.*

Industrial Paper Tape

Although leaving no adhesive deposit when removed, the No. 131 Behr-cat Flatback paper tape has high strength and adhesion. It has been used to hold protective covering on machine tools and other heavy equipment during manufacture, storage and shipment. Fiber tubes and cartons are sealed with it. A tensile strength double that of standard paper tapes is claimed. The 60-yd rolls are manufacured in widths from ¼-in. to 3-in. *Behr-Manning, Troy, N. Y.*



Heavy-Duty Ratchet Head

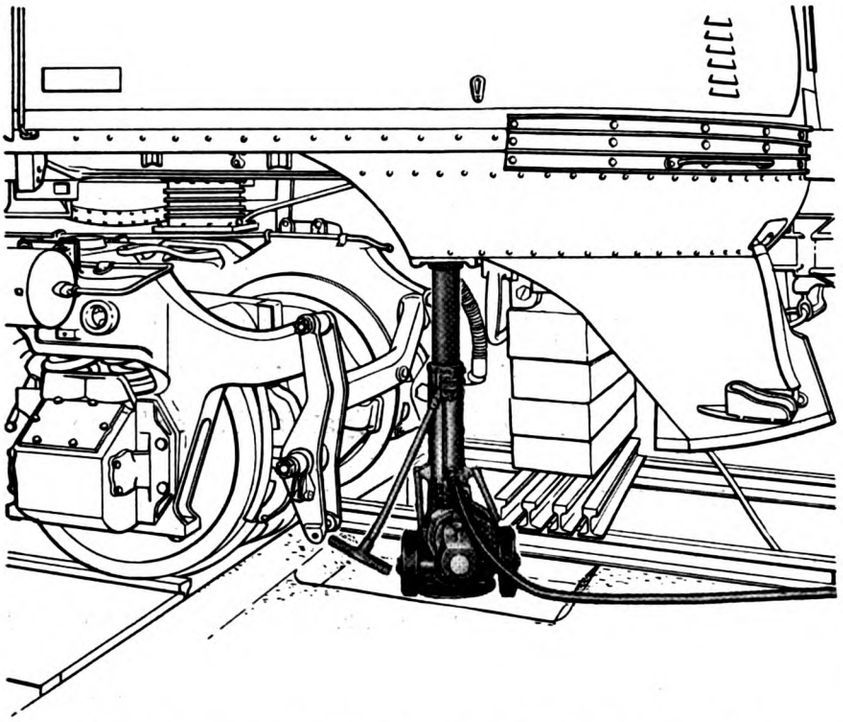
This ¾ in. square drive heavy-duty ratchet head is drop-forged from alloy steel, fully heat-treated for added strength and finished in satin chrome-plate. Its heavy-duty ratchet gear has 24 teeth instead of the usual 16 for quicker, smoother action. A shift lever on the head reverses ratchet action instantly.

A choice of two handles is available, plain or with knurled handle grip. A length of 20 in. for either handle offers more than adequate leverage for the ratchet head. *J. H. Williams & Co., 400 Vulcan Street, Buffalo 7.*

Portable Grinder

Power on this unit has been upped 85 per cent over that of the previous model through the introduction of a motor tailored to grinding operations, according to the manufacturer. Tool weight has been reduced 1-½ lb.

The device, a 6 in. grinder, is designed for continuous duty, incorporating lubricant-sealed ball-bearings. Its centrifugal



How One Man Can Raise the Heaviest Diesel Locomotive in a Few Minutes!

Take two Duff-Norton Air Motor Power Jacks, wheel them into position under the locomotive frame, connect them with an air hose "Y," turn the valve that starts compressed air into the jacks' built-in air motors, then sit down if you wish and watch as the load goes up evenly, smoothly, safely—in a few minutes you can proceed with repairs. Locomotive trucks, for example, can be completely replaced in about 2 hours!

Tests conducted by various railroads in their own shops have shown savings in time and labor that pay for these air motor jacks in a few months.

Get the complete specifications of the various time and labor-saving Duff-Norton Air Motor Power Jacks. They vary in capacity from 20 to 100 tons. Write the world's oldest and largest manufacturer of lifting jacks for catalog AD-11G, Duff-Norton Company, P. O. Box 1889, Pittsburgh 30, Pa. Canadian plant—Toronto 6, Ontario.

DUFF-NORTON Jacks

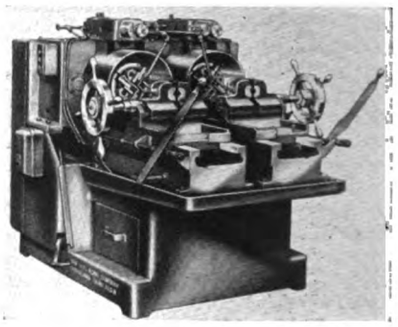
"Giving Industry A Lift Since 1883"

fan produces extreme air velocity through the commutator section, thereby permitting the motor to run cool. Exhaust air is directed away from the operator.

The lower steel inspection plate has been desigend to absorb rough treatment. It also seals the lower side of the field case, thereby preventing pickup of dirt from the work surface. The unit measures 24-½ in. overall and weighs 18-¼ lb with a spindle speed of 3,750 rpm. It is available for either 115- or 220-volt a-c or d-c operation. *Black & Decker Mfg. Co., Towson, Md.*

Compressor Intercooler

Intercoolers fabricated with integral-finned cast-aluminum radiation elements are available for many models of compressors used on diesel-electric and electric locomotives. The radiation element is designed for 500 psi pressure and has the cooling capacity of 40-ft of 1½-in. pipe. The intercoolers are supplied for Westinghouse 3-CD compressors and for the following Gardner-Denver models: ADX, ADJ, ABO, ABX, WXE, and WXO. Piping, fittings and flanges are welded and have threaded connections to the aluminum elements. The entire assembly is subjected to a hydrostatic test of 300 psi. *Wilson Engineering Corporation, 122 S. Michigan avenue, Chicago 3, Ill.*



Threading Machine

Designed to meet the varied requirements of both maintenance and production work, the Model XLA threading machines have rugged simplicity and the capacity to produce precision work. The machines are manufactured in single- and double-spindle designs in 1-in., 1½-in., 2-in., and 2½-in. capacity sizes. The largest will handle pipe sizes from ⅛-in. to 2½-in. Hollow milling and pointing can be done in addition to the threading of bolts, studs and pipe. Tooling for all standard thread forms is available.

The machine bed is equipped with hardened and ground ways to support the carriage. Carriages are lever operated. A hammer-blow handwheel operates the vise jaws which are equipped with grips that are quickly removed by loosening two screws. By regripping the work, unlimited thread lengths can be produced because the spindle is bored to allow the threaded stock to pass through.

A constant speed motor driving through

improve operations!

KNOW WHERE THEY ARE...

WITH 360° GYRALITES! *Quick!*

This new roof-top PYLE Gyralite tells a big story! Mounted on top of diesel switchers and cabooses it flashes in all directions, spotting their location instantly, day or night, saving countless steps and valuable operating time. This new 360° roof-top Gyralite makes the Pyle line of warning lights the most complete in America for protecting railroad personnel and equipment. Literature upon request.

SINCE 1897

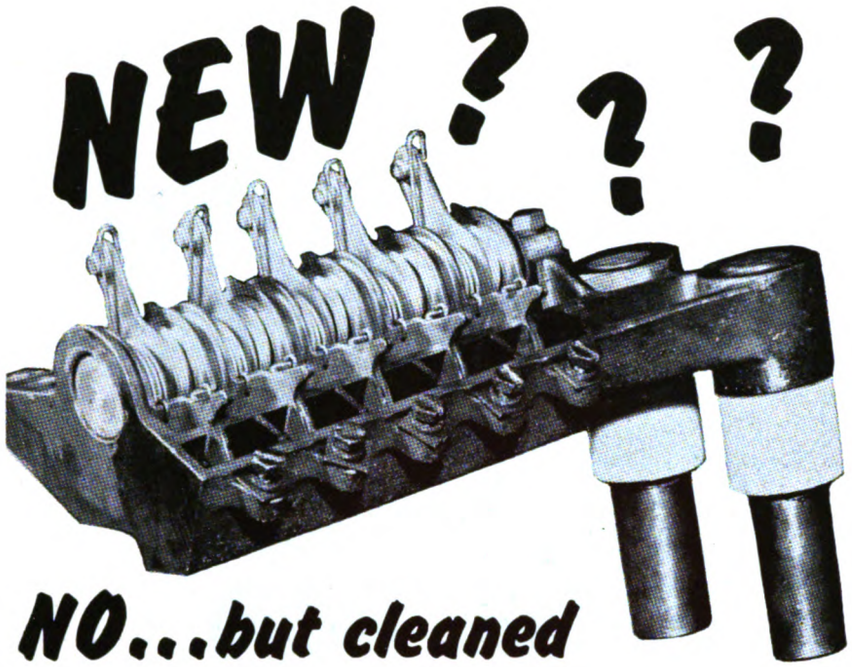
THE PYLE-NATIONAL COMPANY

WHERE QUALITY IS TRADITIONAL

1336 North Kostner Avenue. Chicago 51, Illinois

District Offices and Representatives in Principal Cities of the United States. CANADIAN AGENT: The Holden Co., Ltd., Montreal
Export Department: Railway Supply Co., 30 Church Street, New York

TRAIN LINE CONNECTORS • STAND-BY PLUGS AND CABLE CONNECTORS • TURBO-GENERATORS • FLOODLIGHTS • CONDUIT • FITTINGS • MULTI-VENT



NO...but cleaned with LIX to work like new!

Yes! Lix Diesel Klean Heavy cleans electrical parts to look and work like new, yet does not harm the metals. Just remove the rubber parts, soak in Lix Diesel Klean Heavy and rinse with water or solvent. Lix makes metal parts brighter than new.

- **NO BRUSHING NECESSARY**
- **NO GRANULAR DEPOSITS**
- **REDUCES AFTER-RUSTING**
- **MAKE PARTS INSPECTION EASIER**

Lix Diesel Klean Heavy is harmless to all types of metals during the cleaning process. Lix Diesel Klean Heavy cleans all metals safer, faster–and in the same tank.

All spent Lix Diesel Klean can be reduced and used for cleaning trucks, pits and etc.

Whatever Diesel cleaning requirements you have can be done better and faster with Lix Cleaners.

A FREE demonstration can be arranged in YOUR shop — Call Us Today!

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

THE Lix CORPORATION

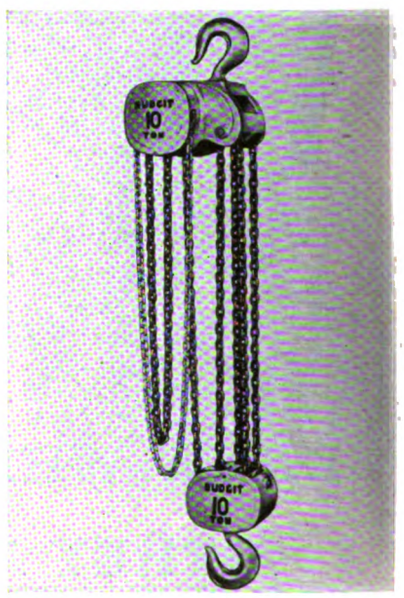
PRODUCTS OF RESEARCH

716 EAST 85TH STREET, DEPT. RL-6
KANSAS CITY, MISSOURI

a four step sheave and V belt gives ample speeds for threading all diameters handled by the machine. Speed changes are quickly made after releasing the belt tension with a foot lever. Double spindle machines have two motors. A push button station controls starting, stopping, jogging, and direction of spindle rotation. Left and right hand threads can be produced.

Model LLH die heads are used. All wear surfaces are hardened and ground. The revolving die head is automatically opened and closed at the ends of the stroke with an air operated machine yoke. The head can be equipped with either radial or tangential chasers. A micrometer adjustment for controlling thread diameter is supplied.

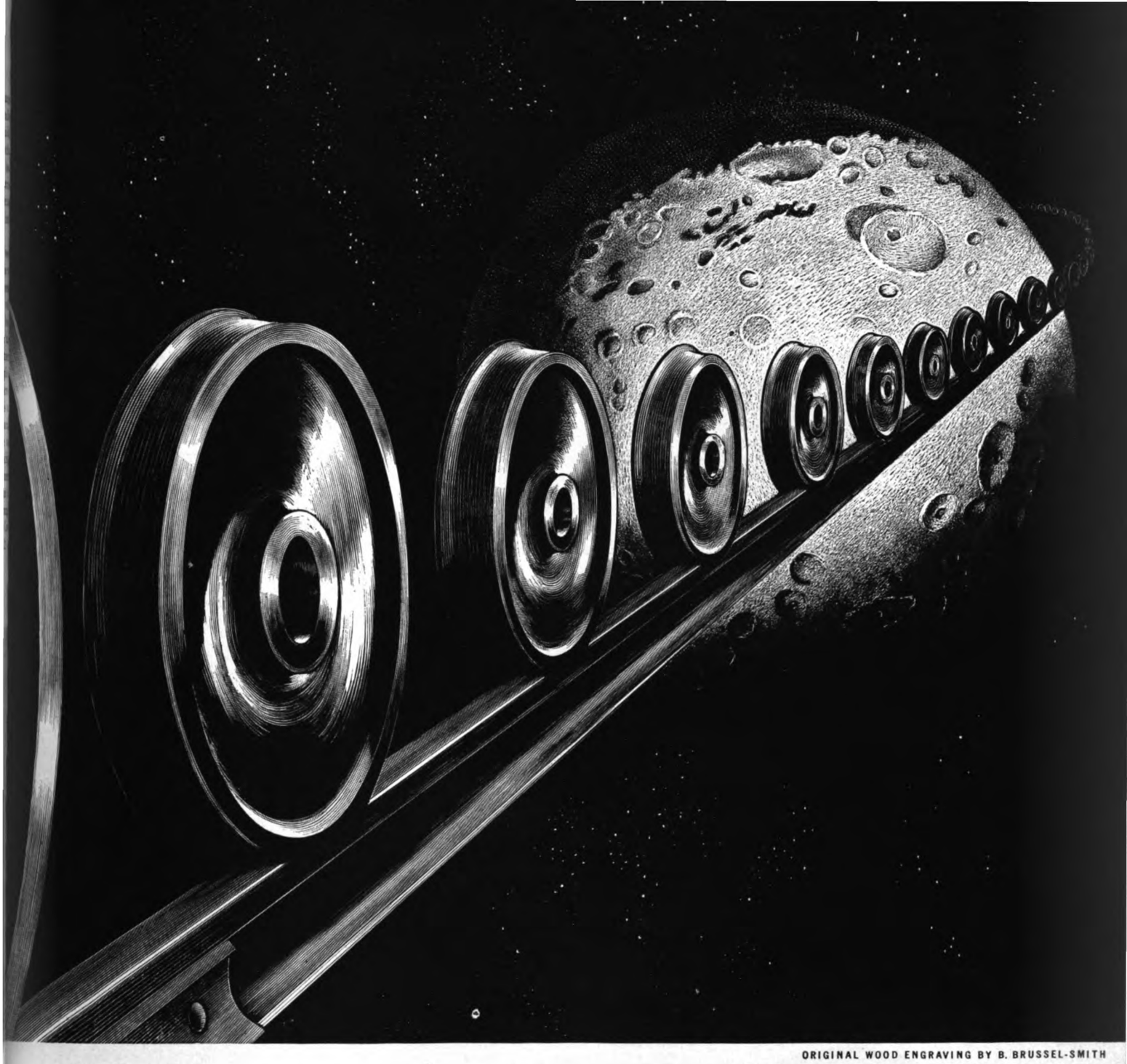
Optional equipment includes a leadscrew, mechanically closed die head if air is not available, and internal trip for producing uniform thread lengths. The machine can be equipped to do multiple pass threading, and a reaming and chamfering attachment is available. A two-speed gear box can be applied to double the cutting speed range. *Acme Machinery Division, Hill Acme Company, 1209 W. 65th street, Cleveland 2.*



Lightweight Chain Blocks

The Budgit Hi-Cap aluminum chain blocks were developed for rugged service where low headroom, portability and ease of operation are required. The frame and covers are made from a tough, shock-resisting aluminum alloy, and the upper hook suspension arm is cast as a part of the frame. The upper hook is one size larger than the lower, and both hooks are of the non-fracturing type that slowly open under extreme overloads.

Splined connections, alloy-steel heat-treated gearing and shafts, and anti-friction bearings are used throughout. The gear design is arranged to distribute the loads over two sets of gear teeth. A non-gagging four pocket lift wheel enclosed by a floating chain guide permits operating the hoist in any position. The blocks are available in 3-, 4-, 5-, 6-, 8- and 10-ton



ORIGINAL WOOD ENGRAVING BY B. BRUSSEL-SMITH

these cast steel wheels are rolling back!

It's 238,857 miles to the moon—yet many Southern® cast steel wheels have already covered this distance and are well on their way back! In fact: five test cars have averaged over 275,000 miles, and one has rolled up more than 350,000!

Road tests on Southern cast steel wheels have taken *eight years* to run. They have yielded valuable experience that cannot be obtained in any other way. Laboratory tests and accelerated life tests are vital too—we were running these on our cast steel wheels over ten years ago—but in actual service there is no substitute for the test of time.

You can put this time-proven, service-proven, machined-tread Southern wheel under your freight cars for *lower cost* than other steel wheels.

SOUTHERN WHEEL DIVISION

AMERICAN Brake Shoe COMPANY

AMCW

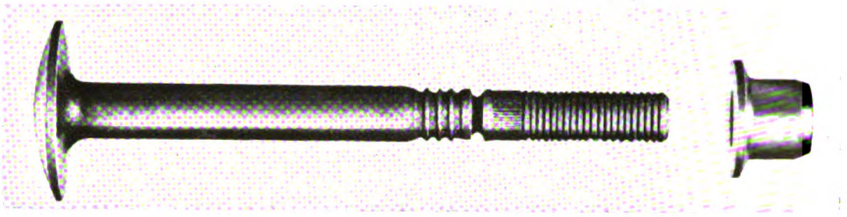
230 PARK AVENUE. NEW YORK 17. N.Y.

capacities. *Shaw Box Crane & Hoist Division of Manning, Maxwell & Moore, Inc., Muskegon, Mich.*

Single-Coat Car Enamel

A one-coat freight-car enamel, Kem-Kold-Bild, is claimed to produce two-coat results when applied with conventional cold spray equipment. This synthetic high-solids enamel gives a 0.00125 to 0.002-in. dry-film in a single coat, and has a gloss finish. No surface sagging has been shown with a coat as heavy as 0.0025 in. Under normal drying conditions cars have been stencilled two or three hours after painting.

Kem-Kold-Bild is recommended for use over a zinc chromate primer. It has shown no tendency to lift or otherwise adversely affect the primers now in general use. This single-coat car enamel is supplied in standard railroad colors. *Sherwin Williams Company, Transportation Division, Cleveland 1.*



Non-Twisting Bolt

Type CL Huckbolts designed for permanent fastening of wood to metal, can be installed at the rate of 25 per min. Their large bearing surfaces give a positive clamp that will not spin or loosen from vibration and twisting.

Available in steel with brazier or countersunk heads, the bolts are said to be ideal for fastening wood floors, sides and ends of freight cars, as well as for metal treatment of thresholds. The Huckbolt can easily be installed by one man. It is inserted in the hole and the collar slipped over the extended pintail. A pneumatic or hydraulic pull gun automatically tightens the device to uniform tension, forcing the wood tight to the metal, and swages the collar into the locking grooves. The pintail is automatically broken and ejected. *Huck Manufacturing Company, 3480 Bellevue avenue, Detroit 7.*

NOW! ONE WELDER

IDEALARC... GIVES YOU

BOTH AC and DC

WELDING CURRENT

NOW DC Industrial Welder for operation on single phase power lines

NOW Rectifier Welder with both current and voltage controls

NOW Rectifier Welder with arc-booster starting

● One machine, Lincoln Idealarc, now gives you *both* AC and DC welding current. You have *both* current control and voltage control. For every job, you can now select the ideal arc . . . soft arc or forceful arc . . . AC or DC.

Shops which do not have 3 phase power can now use DC. Idealarc is the only DC welder to operate from single phase power available at reasonable prices in industrial sizes.

With dual arc control on DC, you have the same benefits of soft arc and forceful arc for welding with DC as with AC. Arc-booster starting on both AC and DC . . . on both soft arc and forceful arc . . . assures non-sticking, easy operation, speeds intermittent welding, gives full penetration at the start of each weld.

Idealarc cuts duplication of welding equipment . . . saves on welder cost. So why tie down your operations with one choice of welding current? Idealarc provides complete freedom to select the correct arc type and welding current for maximum speed, maximum ease and quality of welding . . . for the same investment.

SEND FOR FACTS

Send for Bulletin 1343

Shows how you can cut welding costs . . . now. Write:

THE LINCOLN ELECTRIC COMPANY

DEPT. 4602, CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Portable Vise Stand

According to the manufacturer, the unit makes an efficient on-the-job work bench for the pipe fitter. The stand sets up or takes down in a jiffy, as it is constructed of one piece with no loose parts. Its built-in tray pushes up and folds for easy carrying and compactness. Though light in weight for portability, the device is sturdy and won't fold up in use.

Features of the unit include a large size vise base for easy mounting of Toledo or other vises, three pipe benders, plenty of tool slots, pipe rest and ceiling brace. *Toledo Pipe Threading Machine Company, Toledo 4, Ohio.*

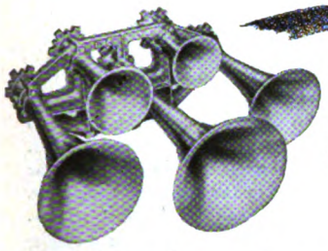
Open Gear Mist Lubricator

This spray control valve operates automatically in conjunction with centralized lubrication systems to provide controlled mist lubrication for open gears. The valve may be assembled to any lubricant injector in the centralized system, mounted either adjacent to. or remote from, gears to be lubricated.

As the injector begins to discharge lubricant, movement of the injector indicator stem permits the spray control valve to open, allowing regulated air to pass the

PROVED!

BEST BY TEST



• In two years of actual road service, Leslie-*Super*tyfon Air Whistles have proved most dependable, most audible, most trouble-free of all air whistles.

SEND FOR — Technical Data Sheet 531

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Batch cleaning of all types of filters by the Magnus Method eliminates handling of individual filters throughout the cleaning, oiling and drying operations.

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As a result, labor costs are reduced to the part-time wages of one unskilled worker. Cleaning in batches of several filters at one time also enables you to keep ahead of schedule with a supply of cleaned filters always on hand.

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Filter cleaning by the Magnus Method is far better than is obtainable with steam gun, spray or geyser type equipment. Filters are cleaned, corner to corner, of all dirt and clogging deposits. Initial equipment cost is surprisingly low.

Use the coupon below to obtain complete information on the Magnus Filter Cleaning Method.

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Railroad Division
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Please send information on Magnus Filter Cleaning Method.

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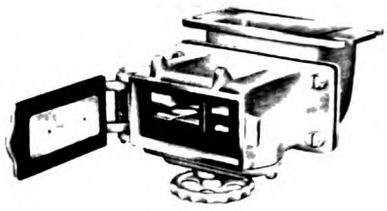
CITY_____ ZONE____ STATE_____

spray nozzle which atomizes lubricant into a fine, uniform mist of air and lubricant.

Lubricant output can be increased, as desired, by diverting lubricant from two or more injectors through lubricant line to the adjustable spray nozzles. *Lincoln Engineering Company, 5702-14 Natural Bridge avenue, St. Louis 20.*



Trainline Receptacle

Two and 3-pole Rain-Tight trainline receptacles add safety when used in 110-volt applications. The danger of touching live parts is eliminated according to the manufacturer. An all-insulated pressure plate clamps the connector fingers in the receptacle contacts.

The receptacle meets all AAR standards. The contact insulating enclosure is a single-piece oil-resistant rubber unit designed to minimize maintenance and to provide better alignment of contacts through resilient floating action. A gasketed cast aluminum alloy housing encloses all current carrying parts. It has slotted hexagon cap screws for solder or solderless type terminal lugs. Parallel barriers molded into the rubber insulation unit separate and align the wire connections. *Pyle-National Company, 1340 N. Kostner avenue, Chicago 51.*

Mobile Communications Power Supply

This dynamotor permits the use of 6-volt or 12-volt mobile communications equipment on 32-, 64- or 110-volt diesel locomotives. With it, switch engines can easily be tied in with the rest of the railway communication system.

They are rated at 70-volts input, 12.8 volts at 5 amp receive and 18-amp transmit. A steady output of 12.8 volts, plus or minus 10 per cent is maintained even with input varying from 5 to 18 amp. Regulation at fixed input is only 0.7

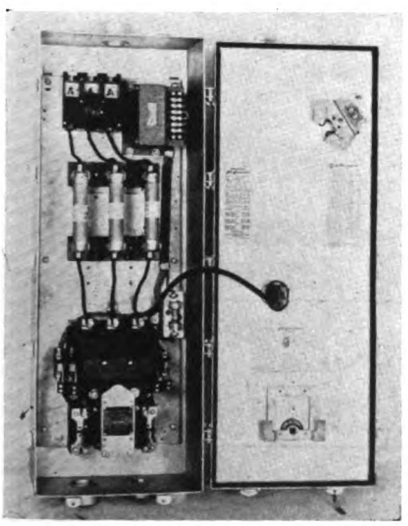
volts transmit to receive. This regulation results from operating a machine capable of 500 watts continuous at less than 100 watts continuous, and less than 250 watts intermittent. Underloading permits slow speed and low temperature rise.

Standard models are available in four input ranges, from 33 to 74 volts, with outputs of 6.3 and 12.8 volts. They are 12-5/8 in. long, 6-11/16 in. wide, 7-¼ in. high, and weigh 47 lb. *Carter Motor Company, 2644 N. Maplewood avenue, Chicago 47.*

Color Tube Paints

A paint color tube system, known as Surfastyle custom colored paints, gives 324 colors for both inside and outside use. Twelve tube colors are combined with base paints to produce this variety of finishes. Two base paints are supplied for each of the following: interior flat, gloss, semi-glass, enamel, and exterior house paint.

The colorant and base are completely compatible and easily hand-mixed. Their use gives a wide range of colors and finishes with a small inventory of paints and tubes. *McDougall-Butler Co., Buffalo 14.*



Linestarter Enclosures

A water-tight enclosure for all combination linestarters through NEMA size 2 has been made available. Fabricated from sheet steel, the enclosure is claimed to be lighter and easier to install than conventional cast iron enclosures.

Finished in bright aluminum, they are equipped with Oil-Tite pushbuttons with neoprene caps to prevent accumulated ice or sleet from interfering with button operation. A gasket and cover held by screws makes the enclosure weather-proof, water-tight, and dust-tight.

Ample wiring is provided within the enclosure. A control circuit transformer can be easily added. External mounting

Does MANUAL BRAKE ADJUSTMENT
cost you real money
every year?

Figure it this way . . . add up the time-costs for adjusting brake piston travel manually. Lost traffic due to terminal delays and yard congestion can be very expensive too. So any way you add it up . . . manual brake slack adjustment is costing you plenty every year . . . and not one cent is necessary. Here's why:

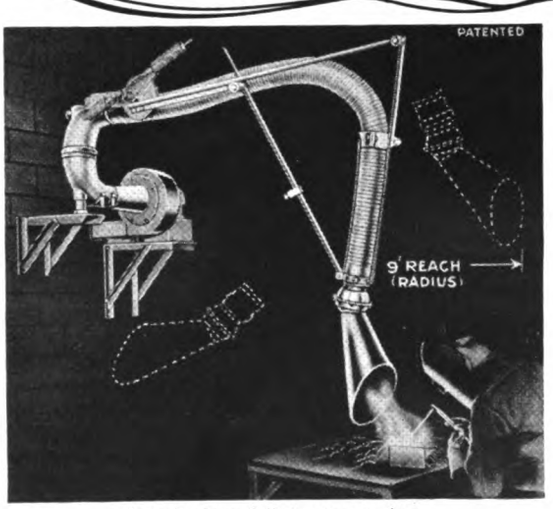
Set it and forget it!

Franklin Automatic Brake Slack Adjuster automatically maintains correct travel of brake cylinder piston. Needs no adjustment or lubrication during the entire life of brake shoes. Completely automatic features make it "foolproof" against negligence and error. It is not affected by train shock or car dumping. You set it . . . forget it. The Franklin Automatic Slack Adjuster is the best money-saving, time-saving investment your railroad can make. It is easily and economically applicable to all types of freight cars . . . including hoppers. To get the facts . . . write for technical bulletin B-1201!

FRANKLIN BALMAR CORPORATION

Woodberry, Baltimore 11, Maryland
Chicago Office: 5855 W. Lawrence Avenue, Chicago 30, Ill.

"It certainly is a relief to have fumes and heat removed while I'm welding. The Ruemelin Collector has great suction. It makes a day's work pleasanter!"



Ruemelin Fume Collector in operation.

Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated at their source, thus improving working conditions, lessening fatigue and paving the way for increased plant production.

The Ruemelin Fume Collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustments necessary. Just pull the inlet hood to the welding position and you are ready to go.

Note the new spring-loaded counterbalance mechanism which makes Fume Collector much easier to handle. Ask for Bulletin 37-E illustrating this new feature.

RUEMELIN MFG. CO.
MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
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Specifically designed for exterior car cleaning . . . the degreasing and cleaning of mechanical parts, motive equipment, engines, engine pits, shop floors.
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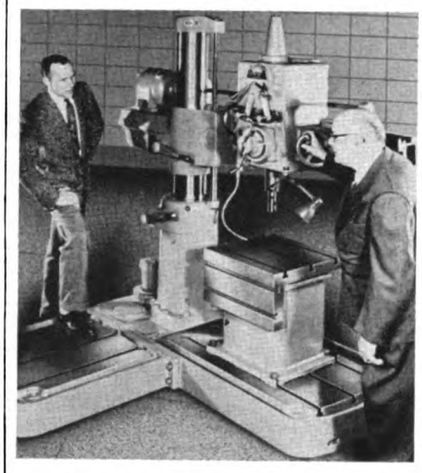
Made to fulfill the need for a heavy duty cleaner and degreaser. Used for rugged jobs, under carriages and exteriors, running gear and surfaces — and areas subject to heavy oil, asphalt and other tenacious accumulations.
The superior solvency of these two emulsion cleaners . . . the effective dirt penetration and easy rinsability cuts cleaning costs and saves valuable personnel time.
also available F.O.-162 and F.O.-102 Carbon Removers
F.O.-128 and F.O.-101 'Safe-tee' Solvents
Write to Dept. '3'. for complete information
FINE ORGANICS, Inc.
211 East 19th St. • New York 3, N. Y.

feet and conveniently located knockouts facilitate installation and service. *Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.*



Radial Drill

Flame-hardening the column resists scoring and is claimed to retain the built-in accuracy of this radial drill. The manufacturer also claims that this is the first flame-hardened radial column used. "Hardclad," as it has been called, is a centrifugal casting which is turned, flame-hardened, and finish-ground to close tolerances.

The 1½-hp main drive motor is mounted on an arm extension at the back of the column. This counterbalances the arm and makes the motor very accessible. Its power is transmitted through a silent chain and a drive shaft mounted in anti-friction bearings. No parts of the main drive arrangement are concealed in the head.

An alloy steel No. 3 Morse taper spindle is mounted in four anti-friction bearings adequate for the radial and thrust loads. There are nine spindle speeds and six power feeds and all speed and feed shafts are mounted in anti-friction bearings.

Many of the operating sub-assemblies are built up as complete, self-contained, and removable units. These include the feed clutch and the feed transmission. The entire internal mechanism is force spray lubricated with an oil pump. The arm is raised and lowered with a ½-hp motor.

This radial drill features two-lever, direct-reading, color-match spindle speed and feed shift dials. All controls are grouped within easy reach of the operator including the start-stop push buttons. A transformer reduces line current to 110-volts at the controls as a safety feature.

The electrical panel is built into the back of the arm. A safety switch on the panel door prevents exposing a live panel because the door can be opened only when the current is off. A guard covers the raise and lower push buttons preventing vertical movement of the arm until the barrel clamp is released.

Adequate area and weight assure stability of the waffle-ribbed base. Securely bolted to the base is a column support incorporating heavy-duty anti-friction bearings which carry the Hardclad column.

This radial has a 3-ft arm and a 7½-in.

FOR SUPERIOR RESISTANCE to ABRASION and CORROSION
Specify
STRATOFLEX
FLEXIBLE HOSE No 225
Built to give long service where conditions are especially rough on hose lines. Reinforced with high tensile strength wire braid with outer cover of tough synthetic rubber. In bulk Hose or Hose Assemblies with Stratoflex "over the cover" detachable, re-usable fittings. Write for your FREE catalog or order through your dealer.
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General Offices—P. O. Box 10398
Fort Worth, Texas
Branch Plants—Los Angeles and Toronto
Sales Offices—Atlanta, Chicago, Dayton, Houston, Kansas City, Los Angeles, Portland, New York, Toronto, Tulsa

column. The drilling capacity is 1½-in. in cast iron and it can drill to the center of a 77-in. diameter circle. Accessories include coolant system, universal or box table, side bases and work light. The box table and side base are shown in the illustration. *Cincinnati Lathe & Tool Co., Cincinnati 9.*

All-Purpose Welder

The Idealarc is said to provide a welding are for every type of manual welding application, permitting selection of either a-c or d-c and either a soft or forceful arc. It can be obtained as an a-c welder without the d-c current. To this unit a d-c package can be easily attached whenever desired. It is also available as a combination a-c and d-c machine with selection of either current made through a twist of a switch handle.

For a-c welding jobs, the machine provides a single-phase transformer type welder, the circuit of which has been designed for high arc stability. Both voltage and amperage are controlled to give the desired control of arc characteristics. The unit also has an arc booster switch for selecting normal or hot starting.

For d-c welding, the unit provides welding current through heavy-duty rectifiers. Dual-control of the arc is provided. The controls create a d-c machine with the quiet operation of rectifier welders and operating ease of motor-generator welders.

Current models available are 300, 400 and 500 amp a-c combined with d-c capacities in 200, 300, 375 and 450 amps. *Lincoln Electric Company 22801 St. Clair Ave., Cleveland 17.*

Insulated Magnet Wire

Alkanex magnet wire is said to be the toughest high-temperature film-insulated wire yet developed for use in motors, transformers, and other electrical equipment operating above 105 deg C. It has the ability to withstand hot spot temperatures up to 150 deg C and has electrical

WATSON-STILLMAN

Socket-Welding Air Brake Flanges

Simplified installation and strong, tough connections are assured with Watson-Stillman Socket-Welding Air Brake Flanges. Machined from tough steel forgings, these 2-bolt oval flanges are now available in two designs—each interchangeable with other air brake flanges. The W-S One-Piece flange, now standard equipment on many railroad cars, provides a strong, leak-proof joint with maximum resistance to shock and vibration.

The recently developed 2-piece Swivel-Joint Flange was designed to facilitate bolt-hole alignment. The flange can be rotated on the insert to any position until bolt holes line up. The Swivel-Joint flange permits most of the piping to be fabricated in the shop.

Sold Through Leading Distributors

For detailed technical information on Watson-Stillman Air Brake Flanges and other Railroad Pipe Fittings send Today for Bulletin RR-1.

WATSON-STILLMAN FITTINGS DIVISION

HKP H. K. PORTER COMPANY, INC.
Roselle, New Jersey

R.2

Manufacturers' Literature

Following is a compilation of free literature, pamplets and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on the coupon below to receive the desired information; the requests will be sent direct by the manufacturers.

1. DUCTILE IRON. *International Nickel.* 32-page booklet (DI-25) "Ductile Iron —The Cast Iron That Can Be Bent" includes detailed specifications and mechanical property data.

2. WHEEL GRINDER. *Whiting Corp.* 8-page 3-color profusely illustrated bulletin (MS-C-401) "New Whiting Wheel Grinder Grinds Wheels Without Removal" includes cut-away views of construction details and actual installation photos.

3. FLAW LOCATION. *Turco Products.* 12-page booklet "Flaw Location by Dye Penetrants" describes in detail the Turco Dy-Chek inspection method and offers helpful suggestions on how to perform inspections on any metal by dye penetrant method.

4. COLLOIDAL GRAPHITE. *Acheson Colloids.* 4-page bulletin (421) contains photos, diagrams, charts and data on advantages offered by colloidal graphite in assembly and run-in of machines.

5. CLUTCH. *Dodge Mfg. Co.* 4-page bulletin (A-634) describes, illustrates and gives prices for the Dodge Air-Grip Clutch; cross-section drawing reveals internal construction.

6. NON-PORTABLE COMPRESSORS. *Worthington Corp.* 6-page editorial reprint of article "Non-Portable Compressors—and installation and maintenance guide" (RP-725) covers such points as: location, piping, temperatures, lubrication, inspection, maintenance.

7. FINISHES FOR ALUMINUM. *Aluminum Company of America.* 48-page multi-color booklet (AD 456) "Finishes for Alcoa Aluminum" with beautiful full-color photographs gives a comprehensive and informative description of the many ways in which the appearance and performance characteristics of aluminum can be changed.

8. TUBE EXPANDERS. *Gustav Wiedeke.* 4-page 3-color brochure "News Bulletin Featuring New-Modern Tube Expanders For Industry" shows the latest tube expanding equipment; photos show typical boiler and condenser units for which tube expanders are recommended.

9. GRATING. *Blaw-Knox.* New 16-page grating catalog (2486) "Electroforged Steel Grating and Treads" describes types, sizes and load characteristics of complete line of electroforged steel and interlocked aluminum grating made by Blaw-Knox.

10. AUTOMATIC MACHINES. *Ex-Cell-O Corp.* 20-page 3-color illustrated brochure (B551) "Opportunities Through Automation" describes and illustrates with large photos and informative captions Ex-Cell-O standard, transfer and special machines equipped with mechanisms for automatic loading and unloading of workpieces.

11. CABLE VULCANIZERS. *Joy Mfg. Co.* 16-page 2-color illustrated bulletin (B48a) "Electric Cable Vulcanizers" describes and illustrates a wide variety of vulcanizing equipment for repairing or replacing broken or bruised cable jacketing.

12. BATTERIES. *C&D Batteries.* Two specifications bulletins (CP-536-537 Rev. 1) cover C&D complete line of lead-calcium and lead-antimony batteries for control, switchgear and auxiliary power application; specifications include data on battery ratings and capacities.

13. TACHOMETERS. *Herman H. Sticht.* 8-page bulletin (770) describes, illustrates and gives specifications for all types of Standco Vibrating Reed Tachometers; shows how to read them.

14. ROLLER BEARING. *Rollway Bearing Co.* 4-page catalog describes new self-contained cartridge roller bearing; lists shaft and housing dimensions and bearing radial load ratings at 100 rpm.

15. TANK CAR COATING. *Metalweld, Inc.* 4-page illustrated reprint-bulletin "Lining and Coating Tank Cars" covers use of sheet linings, liquid synthetic resin coatings, sprayed metal coatings and combination coatings to protect equipment from chemical attack, products from contamination.

16. ELECTRICAL CONDUIT. *National Electric Products.* Booklet with 4-color photos describes and illustrates heavy-duty, rigid steel electrical conduit (Superduct); includes data sheets compiled by Pittsburgh Testing Labs showing how it stands up under corrosive attacks of salt spray, sulfuric acid, caustic soda, and exposure to excessive heat.

17. CARBIDE METAL TOOLS. *Carmet Div., Allegheny Ludlum Steel.* 8th edition of 20-page Carmet Methods Manual includes data on applications of new steel cutting grades CA-608 and CA-610; includes table of cutting speeds.

Reader Service Department **JUNE, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

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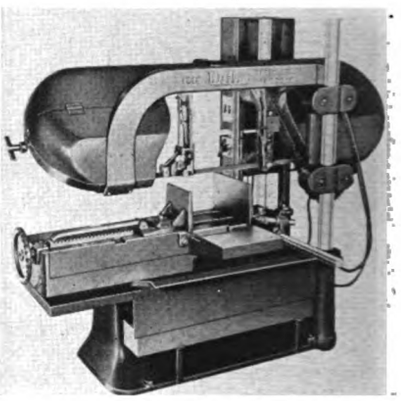
and thermal properties that will help to effect economies in the design of motors and similar equipment.

The insulation is a thin-film polyester-type with high heat-resistant properties as well as resistance to abrasion and solvents. This insulation will enable engineers to increase the horsepower of motors without increasing their size. It is estimated that 90-95 percent of all motors could operate in the Class B high-temperature range for which Alkanex is designed.

The wire is available in round sizes No 13 AWG through No 26 AWG with single and heavy-wall film thicknesses. Other sizes will be considered on a special basis. *Wire and Cable Department, General Electric Company, Bridgeport 2, Conn.*



Metal-Cutting Band Saw

The Model 1200 is a heavy-duty, hydraulically operated, metal-cutting band saw. The saw has blade pressure controls with a wide range of uniform feeding pressures, The electrical system gives over-load and low-voltage protection. All controls are 110 volt and are located for operating ease.

A rigid positive stock stop and automatic cutting cycle are provided. There are heavy-duty adjustable blade guides, adjustable stops for depth cutting and a special chip flushing unit.

The saw handles rectangular shapes 12 x 16-in. and 11 x 18-in., and 12¾-in. diameter rounds. The 1-hp motor drives the blade at selective cutting speeds of 60, 115, 200 or 300 ft per min. *Wells Manufacturing Corporation, 1516 Polk street, Three Rivers, Mich.*

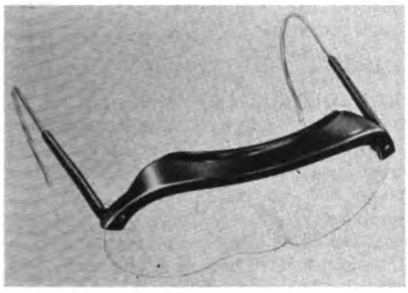
Oil-Air Ratio Regulator

This unit has been designed for controlling oil burners by the varying of pressures. It consists of an oil pressure regulator with a relatively large air operated diaphragm to control the delivery pressure of the oil. The diaphragm is subject to the variations occurring in air pressure. The ratios of the oil diaphragm which is subject to direct pressure of the oil regu-

lator discharge, and the air diaphragm, govern the final oil discharge pressure of the unit.

The regulator is installed in the oil supply line to a group of burners and located as near as practical. A connection is provided for a small air transmission line coming from the outlet side of the air control valve in the main secondary air supply line. When the secondary air pressure is varied by the control valve, the resulting pressure variation is transmitted to vary the pressure in the ratio regulator. This causes the regulator to automatically vary the delivered pressure of the oil in exact proportions to the air delivered to the burners.

The regulator is built to satisfactorily handle inlet oil supply pressures from 45 to 75 psi. *Hauck Manufacturing Company, 124 Tenth street, Brooklyn 15, N.Y.*



Safety Goggles

The large, impact-resisting, plastic lens of the FeatherSpec (Style FW3) provides ample safety on such jobs as woodworking, light grinding, spot welding, inspection and others which do not require the use of heavy-duty goggles. Its contour-line brow rest holds lenses well away from the eyes. This extra space permits cool comfort and additional clearance for workers who wear prescription glasses. The brow rest is integrally molded of bronze acetate butyrate. Distortion-free lenses are 0.040 in. thick acetate, clear or green, and can be removed easily. Matching half-plastic, half-cable temples adjust for a snug fit. *Willson Products, Inc., Reading, Pa.*

Multi-Purpose Welding Electrode

Mild steel can be welded to stainless steel with Inco-Rod "A". Strong joints can also be produced between either of these materials and high-nickel alloys such as Monel and Inconel. The rod, itself, is a high-nickel alloy composition, developed for the specific purpose of joining dissimilar metals.

Ductile and crack-free joints have been produced between carbon steel and such austenitic steels as 304, 310, 330 and 405 stainless. Also successfully welded have been 316 to 405, 347 to Croloy, and other such stainless combinations. Tests have shown the joint strength sufficient to force failure in the base metals. Corrosion tests

It's the new BONNEY "X-4"—the amazing, muscle-saving 4-to-1 Geared-Head Wrench! Now, 1 man can do the job of 4 in all heavy assembly and disassembly work! In tightening or loosening threaded parts, there is no dangerous snap or jarring action. The Bonney X-4 *makes tough jobs easy!*

The new BONNEY "X-4" is designed as an *intermediate unit* for use with ratchets, torque wrenches, sockets, and attachments. Rugged, lightweight, portable—the unit is easily used in shop or field. A mechanic can do his own work with less effort, greater safety, with no chance of damaging equipment.

Get the complete story!

BONNEY FORGE & TOOL WORKS
Allentown 11, Pennsylvania

Please send me detailed information on the new BONNEY "X-4" 4-to-1 Geared-Head Wrench.

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With or Without Snap-Button Holes

- toughest spring steel rollers
- cold-rolled welded steel tubing
- snap-button damage protection for premature pull-a-parts
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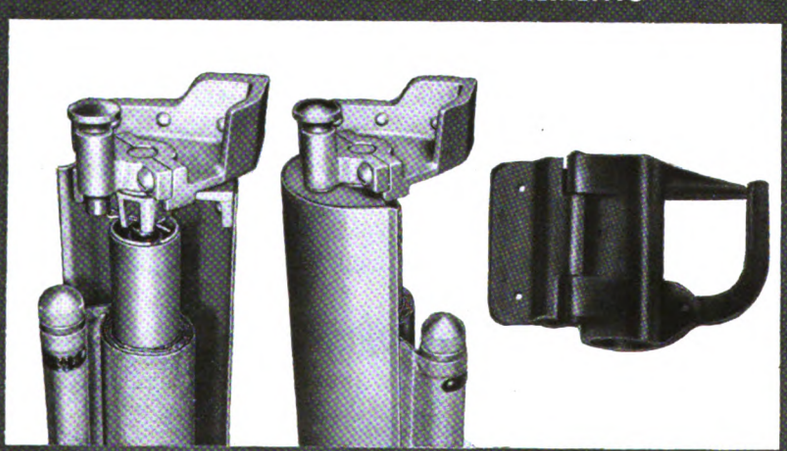
CURTAINS, PARTS, HANDLES, HOOKS and BRACKETS for ALL REQUIREMENTS



Revolving shield and casing (shield open)

Revolving shield and casing (shield closed)

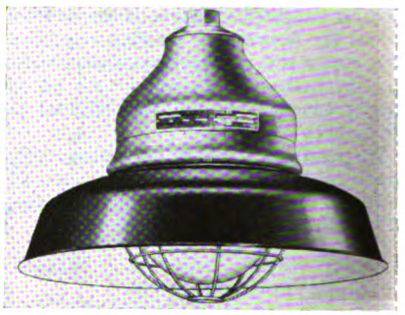
The new "B-J" vestibule curtain release handle. Positive releasing feature . . . service-proven.

morton

MANUFACTURING COMPANY

5125 West Lake Street, Chicago 44, Illinois

in most cases show the weld material superior. The rod is applied downhand and produces welds free of gas holes. Generally no preheat, postheat, or peening is necessary. The rod is supplied in 14-in. lengths and diameters of 3/16, 5/32, and ⅛-in. *International Nickel Company, 71 Wall street, New York 5.*



Explosion-proof Light Fixture

The LE series lighting fixtures are for industrial lighting in hazardous locations and are explosion-proof. They have mogul screw base porcelain lamp receptacles for 300 or 500-watt lamps. Housings are cast aluminum and the reflectors are porcelain enameled. The clear impact-resisting glass globe is protected with a steel guard. This globe has a ground flange which is held against an accurately machined surface on the fixture with a threaded ring. All other joints are threaded and locked with set screws. A choice of reflectors is available. *Pyle-National Company, 1340 N. Kostner avenue, Chicago.*

Step Ladder

Hi-Boy safety step ladders reach working levels up to 15-ft. The ladders are all-welded with a frame of ¾-in. steel tubing. They are mounted on four heavy-duty ball-bearing casters. The front casters swivel and those at the rear are rigidly mounted.

When moved into position the ladder is anchored to the floor by depressing a pedal under the first step. This causes two rubber-tipped legs to contact the floor and prevent further movement. These legs are retracted by spring action when the pedal is moved to the left. Six models with 9 to 12 steps have overall heights from 85½-in. to 114-in. All models have sturdy guard rails and non-slip step plates. *Ballymore Company, Wayne 1, Pa.*

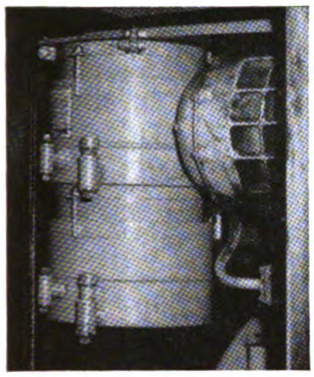
Tripod Vise Stand

The Pipemaster Tripod vise stand was designed to adjust automatically on pipe from ⅛ in. to 2½ in., and to clamp on it with less than one turn of the screw. Another feature is its 3-way, long tool-steel top jaw with milled teeth. The bottom jaws are reversible.

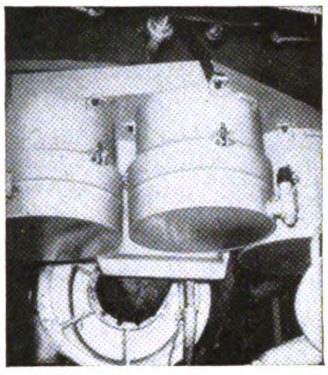
The unit has a large, hinged malleable

Two of the hundreds of AIR-MAZE oil bath diesel filter installations that...

CUT BOTH FILTER AND ENGINE MAINTENANCE—PAY FOR THEMSELVES IN A YEAR!



SOUTHERN RAILWAY. A 2 element manifolded oil bath filter on SW7 1200 horsepower switcher.



NEW YORK CENTRAL. A 3 element manifolded oil bath filter, in use on ALCO 1500 horsepower locomotive.

ALREADY FORTY RAILROADS have adopted Air-Maze oil bath air filters for hundreds of diesels used in freight, passenger and switching service. And reports show they cut both *filter* and *engine* maintenance—pay for themselves in a year!

In areas where airborne dirt concentrations are heavy, ordinary filters must be cleaned as often as twice a week. By contrast, Air-Maze oil bath air filters go at least three months without servicing. That's 24 times longer without service!

This reduced filter maintenance is not obtained at the expense of filter efficiency and increased engine wear. Air is scrubbed clean in a bath of oil and an oil-washed screen traps any remaining dust, passing only clean, oil-free air. This thorough cleaning action not only lets Air-Maze oil bath air filters go for longer periods without servicing but, more important, provides the cleaner air which extends power assembly life of the locomotive, reduces down-time, lowers engine maintenance costs.

Over 98% of all internal combustion engines in use are protected by oil bath filters. The day is coming when most diesel locomotives will benefit from oil bath air filtration. Air-Maze oil bath filters are effective at all engine speeds—do not depend on high air velocity. They work effectively at low pressure loss. And they are not affected by humidity or oil mist conditions. For further information, call on us or see your locomotive builder. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
Electromotive	800-900	Switcher	Alco-GE	2250	Rd. Switch
Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1200	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
Alco-GE	1500-1600	Rd. Switch	F-M	2400	Trainmaster
Alco-GE	1500-1600	Rd. Freight			

AIR-MAZE **The Filter Engineers**

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

Why this Jam-Proof 65R RIDGID is most pipe threader for your money

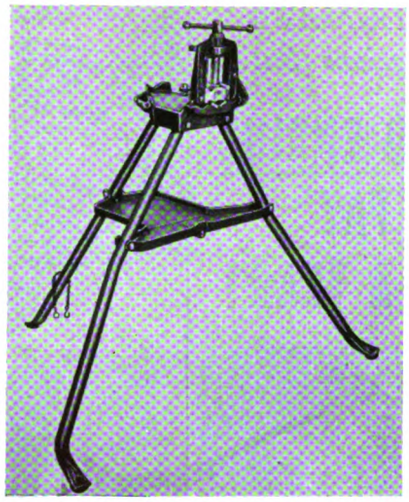
Easiest to Use... Threads 1", 1¼", 1½" and 2" pipe and conduit with 1 set of chasers that adjust to size in 10 seconds. Mistake-proof self-centering workholder sets instantly to size. Threader can't jam—it kicks out automatically when standard length thread is cut. Unbeatable speed, least work.

Perfect Threads... 65R cuts beautiful threads—and you find the factory test sample in your new die stock to prove it. No other threader gives you as much for your money.

Ask to see the 65R at your Supply House. Try it, buy it—it's a bargain in satisfaction.

The Ridge Tool Company, Elyria, Ohio, U.S.A.

RIDGID
Work-Saver Pipe Tools



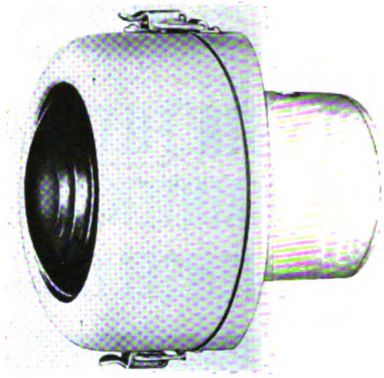
shelf that insures rigidity in use and provides space for many tools. It has a vertical visible pipe bender and ceiling hold-down screw. Its pipe legs are formed for maximum stability. *Erie Tool Works, Erie, Pa.*

Midget Volt-Ohmmeter

Called the Midgetester, this unit is a practical working instrument with ruggedness and accuracy of devices many times larger. The Model 355 can be put in the shirt pocket. It measures 2-¾ in. by 4-½ in. by 1 in. overall.

The unit has a sensitivity of 10,000 ohms per volt on both a-c and d-c circuits. It is equipped with 14 measurement ranges, 5 for a-c voltages, 5 for d-c voltages and 4 for d-c resistances. There is a clear plastic face over the front of the instrument, and a black plastic cover over the back.

Special test leads are furnished with each instrument, one red and one black for easy polarity indications. Each has a partially threaded stud on one end for attachment to the device. *Simpson Electric Co., Division American Gage & Machine Co., 5200 W. Kinzie Street, Chicago 44.*



Marker Light

The P-400006 is a single-aspect marker light for permanent mounting on coach ends. Lamps can be replaced from inside or outside the car. Two screws lock the inside cover in position, and the outside cover is held against a waterproof body gasket with toggle clamps on each side. The lamp, receptacle and inside cover are removed as a unit.

The lens is gasket mounted in the outside cover to give a streamlined appearance. Red, yellow, green and clear stepped lenses can be supplied. The two-prong bayonet-base lamp receptacle is shock-mounted for vibration protection. The body of the light fits in a 4⅜-in. dia hole in the end sheet. *Pyle National Company, 1340 N. Kostner avenue, Chicago 51.*

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unded in 1832

RAILWAY LOCOMOTIVES AND CARS

formerly Mechanical and Electrical Engineer

JULY 1955

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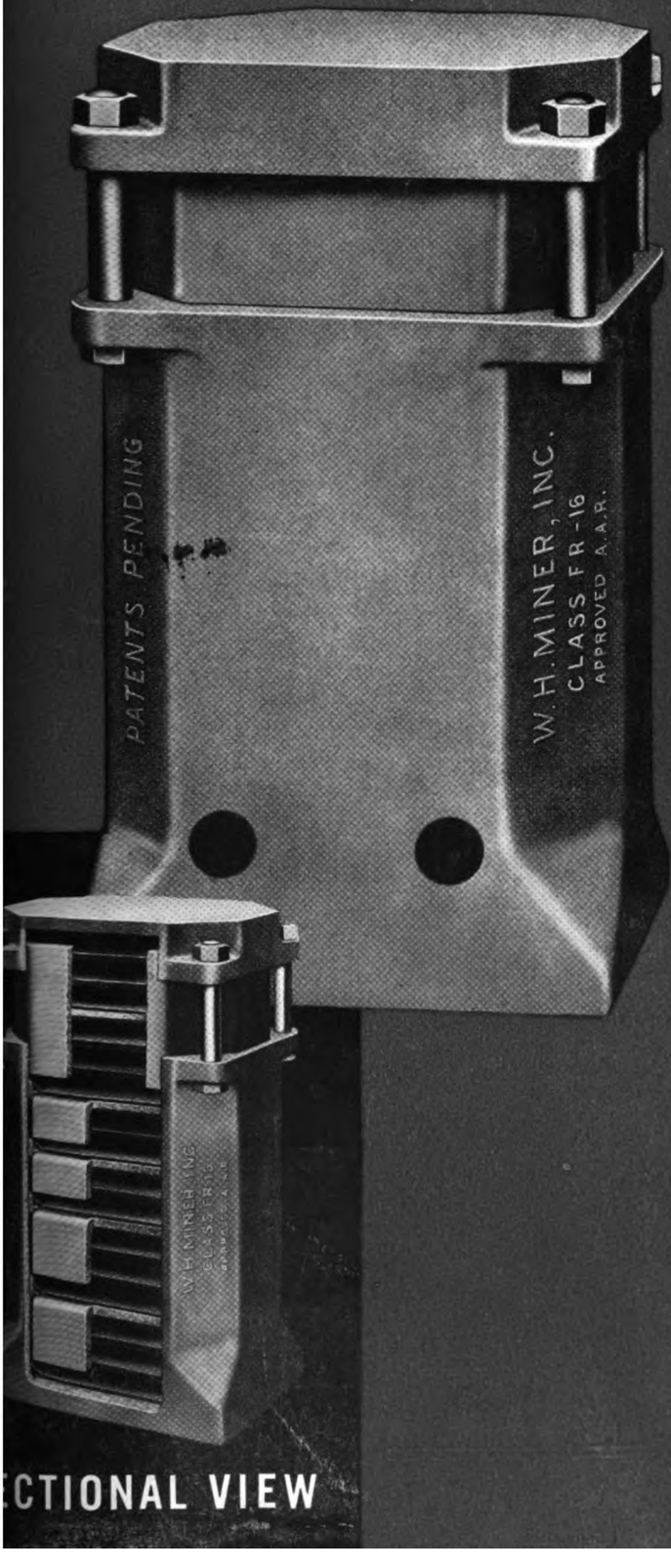


CTIONAL VIEW

MINER

FR-16

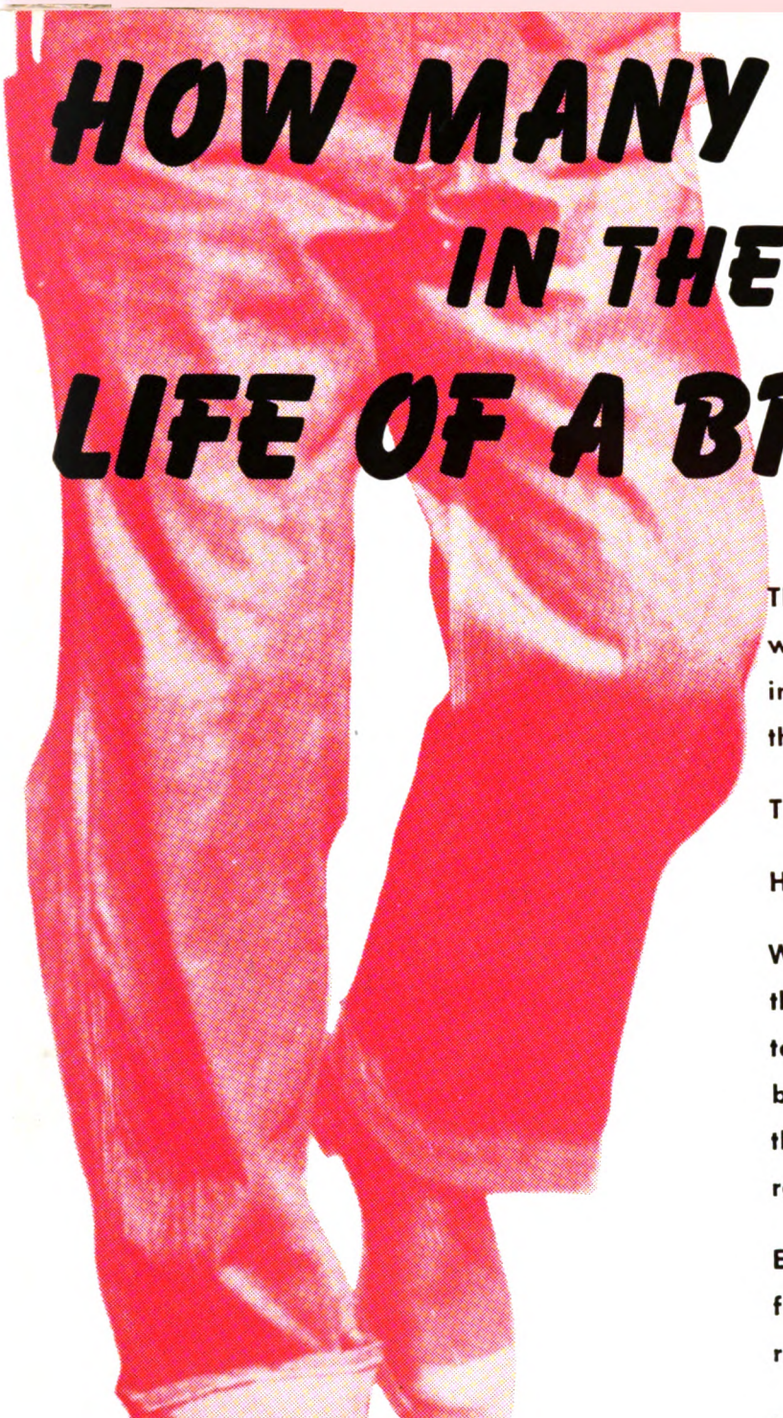
RUBBER DRAFT GEAR

WITH INEXHAUSTIBLE ENDURANCE

providing
Positive and Full Time
Protection
for
Lading and Cars

W. H. MINER, INC.
CHICAGO

HOW MANY STEPS IN THE LIFE OF A BRAKE BEAM?



The railroads use millions of time-consuming, money wasting steps each year carrying freight car brake beam into reclamation plants for dismantling and reassembling— then back again to the stores department.

Truslock cuts the number of those steps right in half!

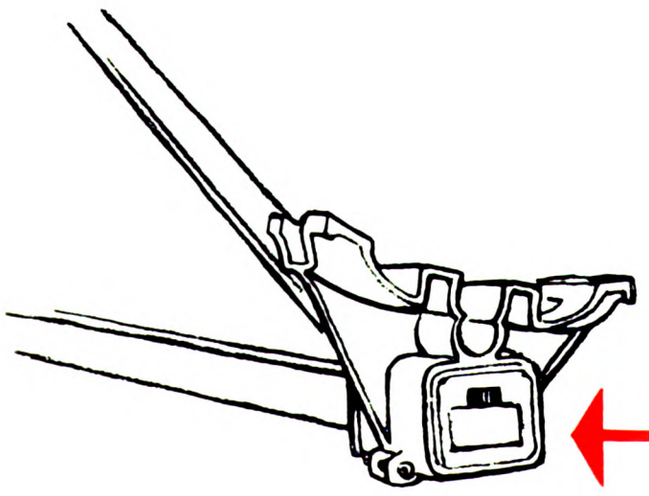
Here's why—

Worn or damaged brake heads account for at least half the brake beams coming into reclamation plants. It stand to reason that a brake beam equipped with a quick-chang brake head—replaceable in a jiffy without special tools the need to disassemble the brake beam—will cut you reclamation costs by fifty percent.

Economical maintenance is only one of the many TRUSLOC features that have sold this premium brake beam to 7 railroads and private car lines.

YOUR FIRST BRAKE HEAD CHANGE ON A TRUSLOCK WIL SAVE YOU MORE THAN THE SMALL PREMIUM YOU PA FOR THIS TOP-PERFORMANCE BRAKE BEAM . . . MAKE TRUSLOCK THE LOWEST COST NO. 18 BRAKE BEAM YO CAN BUY.

BUFFALO BRAKE BEAM COMPANY
NEW YORK • BUFFALO



TRUSLOCK

The Buffalo Brake Beam with the Quick-Change Brake Head

PUBLISHED MONTHLY BY THE

SIMMONS-BOARDMAN

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Founded in 1832 as the American Rail-Road Journal

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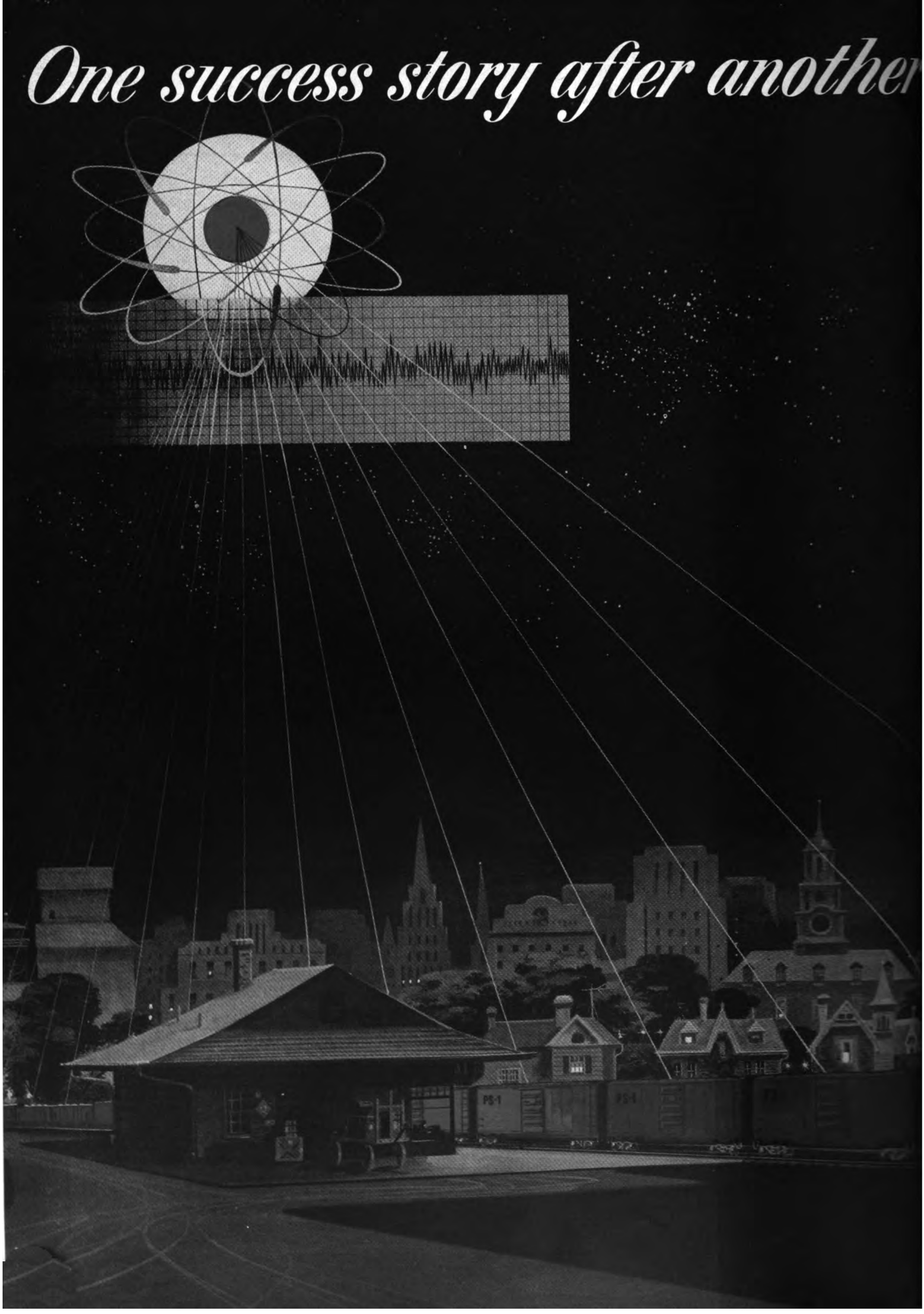

One success story after another

passed by last night

on the

GREAT AMERICAN RAILWAY *System*

In Montreal and Mexico City, in Tacoma and Tampa you could have seen PS-1 Box Cars on the move last night.

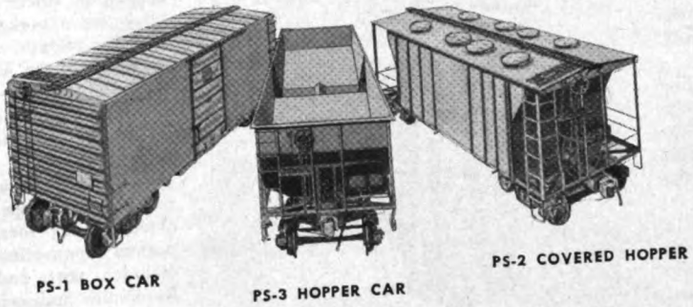
They are the result of research and design which anticipates the wide range of conditions on the Great American Railway System*. And, because they are built to "take it" anywhere, on this system of 402,603 miles of track, they can be counted on to perform at the lowest cost per ton mile, per year of service.

Pullman-Standard sales and service engineers *know* that the 58,000 PS-1 Box Cars, owned by 60 railroads, are establishing outstandingly successful service records. These engineers, traveling over 100,000 miles north, south, east and west every year, study cars of all makes. They search for the origin of parts failures, then follow-up to find out whether the cures are effective. They know the cause and effect of the toughest operating conditions everywhere.

The findings have influenced the construction of the PS-2 Covered Hopper Car and the PS-3 Hopper Car as well as the PS-1 Box Car. And their reports have helped many railroad mechanical men compare car construction values. Thus engineering that starts in the field, contributes to the successful operation of the cars that are designed and built to serve best on the Great American Railway System.

*A typical box car moves, in one year, on 39 different roads, including two or more trips on 24 roads. (A.A.R. data)

Built to serve best on the GREAT AMERICAN RAILWAY SYSTEM



PS-1 BOX CAR PS-3 HOPPER CAR PS-2 COVERED HOPPER

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

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CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

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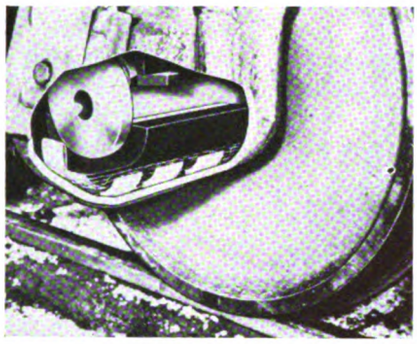
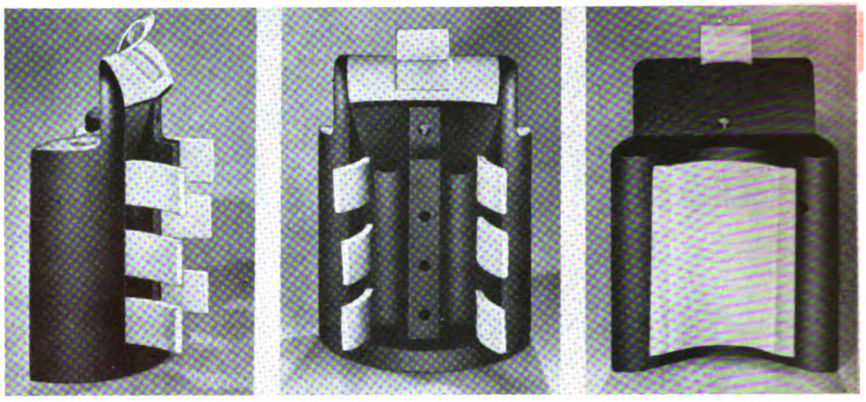


Rubber pad holds the felt wick against the journal surface. To install the lubricator the box must be jacked and the wedge and brass removed.



Side, bottom and top of the Ever-Pac journal lubricator. Wick ends extend into an oil reservoir formed by the lubricator over the bottom of the box.

Journal Box Lubricator

Ever-Pac, which provides wick-fed felt-pad lubrication for freight car journals, has a body of synthetic-sponge-rubber that forms a sealed oil reservoir in the bottom of the journal box. The rubber pad not only seals the oil supply from dirt, but steadily feeds oil over the journal surface and holds the entire assembly in position even during switching shocks.

The rubber pad of this lubricator is resistant to oil, acids, heat and abrasion. The absorbent felt wick-pad fits over the top surface of the pad and its six wick ends pass through slots in the pad into a recess on the bottom. This recess holds two pints of oil; an additional two pints are absorbed by the pad and wick during saturation before application. The wick-pad can be replaced.

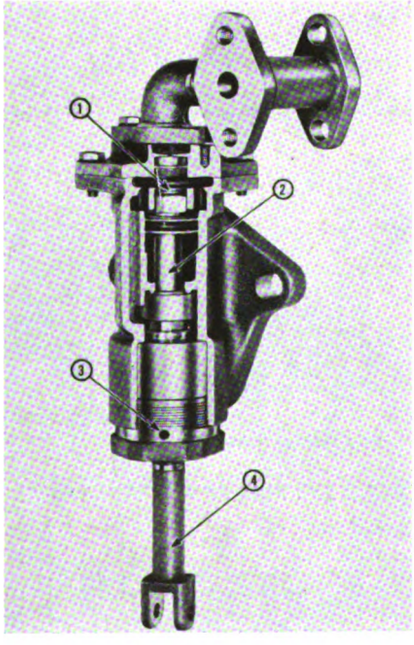
It is necessary to jack the journal box and remove the bearing and wedge to apply the Ever-Pac, but no mechanical changes in the box are required. Because of its compression fit, the lubricator molds itself against the sides and ends of the box interior and can not be dislodged. This is said to prevent loss of oil through the front and rear of the box and to prevent the entry of water and dirt. No seal or special dust-guard is required.

Oil is supplied to the reservoir through an oil filler hole in the front of the lubricator below the journal collar. There is three-way oil delivery to the journal—through the wicks, by pumping through three holes under the felt pad, and by the flexing of the entire pad. The constant, cushioned upward pressure on the surface is claimed to give an even and controlled oil distribution at all temperatures. Every movement of the box or journal supplies additional lubrication. The lubricator now has AAR approval for limited installation on cars in interchange service. *United States Rubber Company, Rockefeller Center, New York 20.*

Brake Cylinder Release Valve

When brakes are bled off for switching on a car equipped with the Caco brake cylinder release valve, the combined auxiliary and emergency reservoir remains charged. This reduces yard time by eliminating the need for bleeding the entire air-brake system to keep the brakes released. When these cars are reassembled into a train, less time is required for charging because little air is needed to bring the reservoirs up to pressure. Designed for application to the AB pipe bracket, this valve is operataed by a pull rod like the standard release rod.

To bleed a car it is only necessary to pull the release rod, hold it momentarily, and go on to the next car. Potential brake failures caused by wedging the AB release rod in the open position are eliminated. When the rod is pulled, the Caco brake-cylinder release valve breaks the communication between the combined reservoirs and the brake cylinder through the AB valve. Only cylinder pressure is bled off; combined reservoir pressure is retained.



When a car with the cylinder release valve is back in a train, the restoration of normal brake-pipe pressure resets the release valve at the same time or just after the control valve in the AB valve goes to the release position. Only a short time is then needed to bring the reservoir pressure to a point where the brake is released or ready for a brake test. The Caco brake-cylinder release valve does not affect the operation of the AB valve. The position of the retainer valve, a stopped-up retainer valve, or functioning of the AB valve does not affect the cylinder release valve's operation.

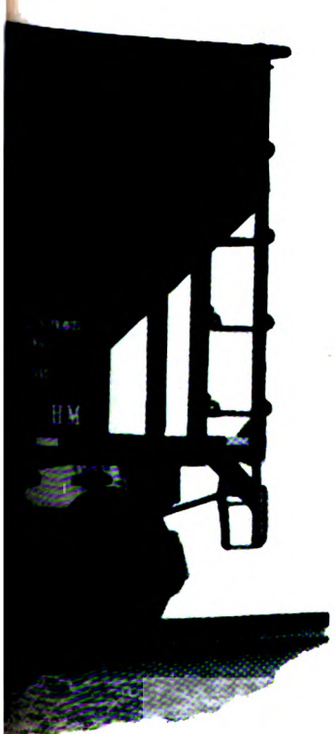
Brake-pipe pressure on top of the floating piston (1) keeps the differential valve assembly (2) located so that there is a normal connection between the brake-cylinder port and the brake cylinder. Reservoirs and cylinder are directly connected and remain this way even when the brake-pipe pressure is released because reservoir pressure is balanced on both sides of the large differential piston and then only acts to hold the small differential piston against its lower seat. When the release rod is pulled (4), it moves the

(*Continued on page 10*)

better with USS COR-TEN Steel since 193

The FRISCO turns to USS COR-TEN Steel

to minimize freight car repair costs and to assure longer service life



THERE IS SOUND THINKING behind the use of USS COR-TEN by the St. Louis, San Francisco Railway Co.

The steadily rising cost of freight car repairs has in recent years focused attention on the economic value of construction that, by more effectively resisting damage and deterioration, will help to reduce such expenditures.

As a result, more and more railroads are adopting a *long range* point of view in their car building and rebuilding programs and are today using COR-TEN Steel construction which they know from experience will keep cars longer out of the repair shop.

Take hopper cars for example. During the normal (35 years) life of a car, body sheets of copper steel must be replaced *two* or *three* times. Under similar conditions and during the same service life, COR-TEN Steel hopper cars will require *only one* replacement of body sheets.

Railroads have estimated that the savings in repair cost thus accomplished are 5 to 6 times the extra first cost of COR-TEN Steel over copper steel. What's more, other substantial savings result from avoiding the time out of service for the additional shopping required by the copper steel car.

It is with these facts in mind that the FRISCO line has in the past five years used USS COR-TEN Steel construction in 800 new freight cars: in 200 70-ton gondolas built in 1950, and in 300 70-ton drop end gondolas and 300 55-ton hopper cars built in 1953 by Pullman Standard.

These hopper cars have been built with future costs firmly in mind. USS COR-TEN Steel is used in all sheets that contact the lading. Their dimensions are significant: $\frac{3}{8}$ in. thickness in hopper chutes and longitudinal hoods; $\frac{1}{4}$ in. side sheets; $\frac{5}{16}$ in. in floor and cross ridge sheets.

When you consider that these sheet thicknesses are equal or heavier than AAR standards and remember that USS COR-TEN Steel has 50% higher yield point than structural carbon steel, has 60% higher endurance limit and 4 to 6 times the resistance to atmospheric corrosion of plain carbon steel or 2 to 3 times that of copper steel, you will agree that longer life than usual and low repair costs can confidently be predicted for this FRISCO equipment.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—
Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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UNITED STATES STEEL

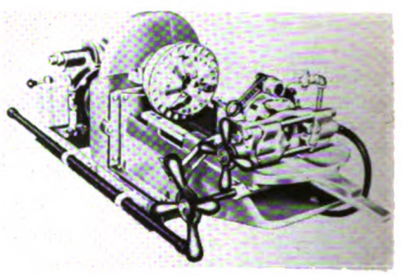
(*Continued from page 6*)
differential valve up against the upper seat of the small piston. The valve assembly is then held here by reservoir pressure acting on the bottom of the large differential piston while the brake cylinder and the passages of this valve vent to the atmosphere down past the differential valve guide and through the ports (3). When recharging, the slight excess of brake-pipe pressure over that in the reservoirs necessary to move the AB control valve to release also moves differential valve to its normal running position where it remains until pull rod is again operated.

All metal parts of the valve except the compression spring are of brass or bronze. Pistons have synthetic rubber seal rings. The valve is lubricated during factory assembly and a wick provides additional lubrication from the floating piston. The valve can be applied to passenger and freight cars. *Crerar, Adams & Co., 1101 West Congress Parkway, Chicago 7.*

Floor Absorbent

Hi-Dri, a granular mineral compound capable of absorbing large quantities of liquid, is an all-purpose floor absorbent, completely fire-proof, non-abrasive and harmless to the skin. Because of its processing, it does not readily break down or cake under heavy traffic, and does not turn to mud when wet.

While intended primarily to eliminate oil and grease on shop floors, it also absorbs solvents, water, acids, paints, resins and other liquids. Hi-Dri draws liquids completely within itself, leaving no slick on the floor. It is claimed to be effective on all surfaces—wood, concrete, brick, steel and others. On floors, the natural light color of the compound increases visibility. *Waverly Petroleum Products Company, 1724 Chestnut street, Philadelphia 3.*



Threading Machine

An increase in threading speed is claimed for the improved Model-A pipe and bolt threading machine. This unit is designed to be portable. It is equipped with a Power-Grip wrenchless chuck which is claimed to increase the chucking speed and the safety of machine operation. *Beaver Pipe Tools, Inc., Warren, Ohio.*

Diesel Torque-Converter Railway Crane

The 250-ton railway crane powered with a diesel torque-converter unit consists of General Motors Twin 6-71 diesel engines driving through a Twin-Disc torque converter and developing 350 bhp. Either of the engines can be used independently to perform all crane functions, including handling rated loads at reduced speed. Fuel savings are effected through the use of only one engine for light loads.

Each engine has battery charging generators, a starting motor, and a heating unit that can be operated with outside power or from a Kohler light plant on the crane. Each diesel has an auxiliary air compressor with sufficient capacity to supply air for normal operation. A larger compressor coupled to the drive shaft with an air clutch supplies air to permit the crane to operate as a switcher.

The crane, built either as a self-propelling or non-propelling unit, has six-wheel equalized trucks using clasp brakes oper-

C-D-F TAPES of TEFLON*

- **Heat Resistant— up to 500° F.**
- **High Dielectric Strength**
- **Strong, tough, durable**

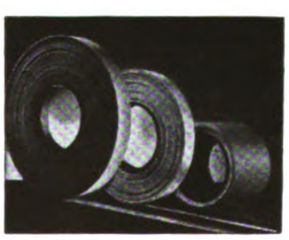
It is no longer necessary to spend time, effort and materials in frequent rewrapping of field coils. Use C-D-F TEFLON tapes for the job—they have unusually long service life. Tapes are easy to apply, easy to handle. Rolls are supplied in a wide range of widths and thicknesses either in 100% TEFLON film or TEFLON glass fabric supported.

TEFLON has high heat resistance—withstands 260° C. (or 500° F.) without appreciably affecting its physical or electrical properties. It meets Class H AIEE standards for maximum hot spot insulation temperature of 180° C. TEFLON has practically zero water absorption and its electrical properties are little affected after long exposure to high humidity. Its dissipation factor and dielectric constant are extremely low and unchanged over a wide range of frequencies.

TEFLON has a wide range of applications in the railroad industry. For wire and cable coverings where the electrical properties must not suffer impairment even under extreme temperature and humidity conditions, TEFLON is the ideal material. TEFLON may be applied in single or multiple wrapping operations which may include a TEFLON glass fabric cloth supported tape on the outside for resistance to abrasion. TEFLON wrapped cables find extensive use in Diesel locomotive wiring where abrasion of exposed wiring, due to undercar blast, is an important factor.

If you are not now using C-D-F TEFLON tapes and want to know more about TEFLON, the most promising of new plastics, write for Folder T-52 with samples. For technical assistance call your C-D-F sales engineer (offices in principal cities). He's a good man to know.

*du Pont Trade Mark



Continental-Diamond Fibre

CONTINENTAL-DIAMOND FIBRE COMPANY

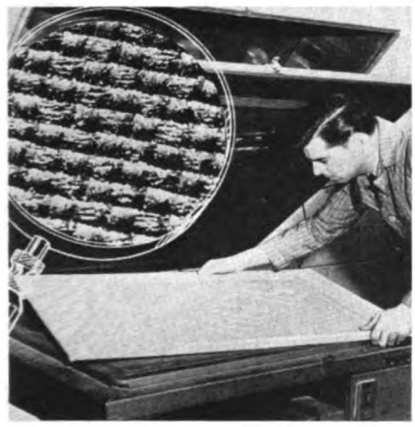
NEWARK 104, DELAWARE

ated by both straight and automatic air. One truck is equipped with a hand brake. The self-propelled crane is driven by a combination of spur and bevel gearing. This drive can be disengaged by a pinion shifter from outside the car body when the crane is traveling in a train.

The car body is a welded structural unit. Heavy-duty cast-steel center and end outriggers are provided. An all-steel cab encloses the machinery and the operator's station. Power is transmitted from the torque converter through a chain drive to air-actuated clutches.

In addition to the main and auxiliary hoists a whip hoist drum can be provided. The swing machinery is driven by spur gears from a second clutch shaft. It is operated by an air-actuated friction clutch driving through a combination of worm, spur and bevel gear reductions. In case of an air failure brakes on all the driving shafts set automatically.

The rated lifting capacity of 250 tons is at a radius of 17 ft 6 in. *Bucyrus-Erie Company, South Milwaukee, Wis.*



Applicator Diaphragm

A new rubber diaphragm for heat-vacuum applicators simplifies the application of reflective sheeting to embossed signs. The diaphragm, of rough rubber, allows air trapped by raised letters and borders to escape through evenly spaced, microscopic depressions in the surface of the rubber. This diaphragm replaces the seamless muslin or bleeder strips previously used in the applicators. *Minnesota Mining & Manufacturing Co., 900 Fauquier street, St. Paul 6, Minn.*

Single-Coat Car Enamel

A one-coat freight car enamel, Kem-Kold-Bild, is said to produce two-coat results when applied with conventional cold-spray equipment. This synthetic high-solids enamel gives a 0.00125 to 0.002-in. dry-film in a single coat, and has a gloss finish. No surface sagging has been shown with a coat as heavy as 0.0025 in. Under normal drying conditions cars have been stenciled two or three hours after painting.

Kem-Kold-Bild is recommended for use over a zinc chromate primer. It has shown no tendency to lift or otherwise adversely affect the primers now in general use. This single-coat car enamel is supplied in standard railroad colors. *Sherwin Williams Company, Transportation Division, Cleveland 1.*

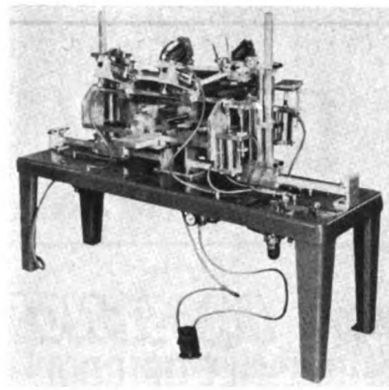
Diesel Fuel Additive

Induco DX200, which is said to clean up carbon sludge faster than Induco Fluid, this manufacturer's original fuel-oil additive, homogenizes and emulsifies the heavy ends, the light ends and the impurities, and suspends them in bubble form. In this state, it is claimed, there is complete burning which results in greater heat output, cleaner engines, increased engine life, and fuel savings. *Industrial Chemical Company, 12134 S. Main street, Los Angeles 61.*

Coil Former

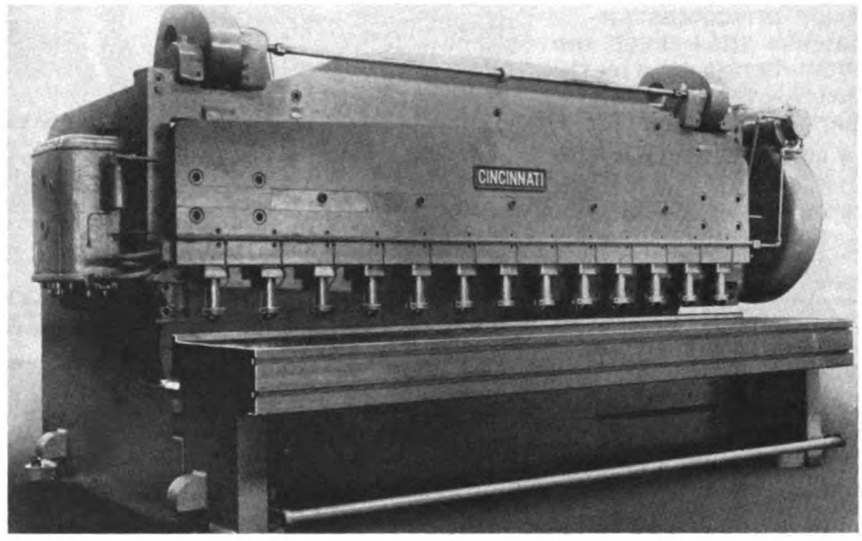
This device can be used to spread heavy coils quickly, accurately and efficiently. Its pneumatic operation takes over practically all the manual labor of coil spreading. Coils are formed with the correct spread and exact pitch and for this reason, they reduce installation time in the stator or armature.

The device is made completely from cold drawn steel, the table legs and top



are constructed of boiler plate. All adjustments for operating and setting are made with one wrench in front of the machine and on top of the table. Pin type knuckle holders assure firm clamping action and quick release.

A single foot pedal opens and closes all four slot holders at the same time. A loop is inserted with the spreader in the closed position and is removed while the spreader is closing. The unit has a slot capacity of 0 to ¾ in. by 1-½ in., and a cylinder capacity of 2 in. diameter. Its maximum slot length is 30 in. and minimum is 3-¾ in. The maximum loop length is 48 in., minimum 6 in. It has an angle range from 0 to 140 deg and full angle can be obtained regardless of width of spread. Manufactured by *James Equipment Company, Cincinnati 18* and distributed by *Electrical Service Manufacturing Company, 17th and Cambria streets, Philadelphia 32.*



Shear

This shear is designed to shear corrugated metals, but will also cut flat plate. Mild-steel sheets 12-ft long can be handled, and there is a slitting adjustment for shearing sheets longer than can be accommodated in one operation. The special table top is recessed to permit proper seating of the corrugated stock, and the 13 hydraulic hold-down plungers are beveled at 45 deg to allow clearance of the corrugations during shearing.

The shear weighs 45 tons, operates at a rate of 20 strokes per minute, and is equipped with a light-beam shearing gauge. The front edge of the table has two T slots. *Cincinnati Shaper Co., Cincinnati 25.*

(New Devices continued on page 82)

FACTS ABOUT Exide®

IRONCLAD® CAR LIGHTING AND AIR CONDITIONING BATTERIES

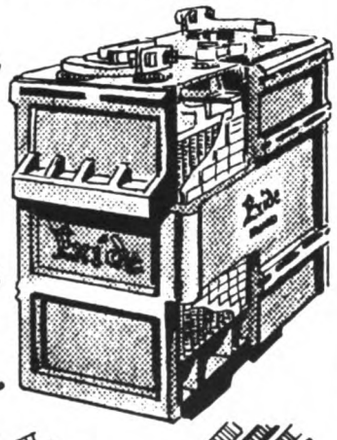
MORE PASSENGER REVENUE! ... RESULT OF COOL, COMFORTABLE CARS

WHEN OLD SOL POURS ON THE HEAT, DEPENDABLE EXIDES KEEP PASSENGERS COOL AND HAPPY. DURING EXTREME HEAT AND LONG STATION STOPS, POWERFUL EXIDE-IRONCLADS KEEP EQUIPMENT FUNCTIONING, WITH COMPRESSORS RUNNING STEADILY. IRONCLAD AIR CONDITIONING AND CAR LIGHTING BATTERIES GIVE YOU HIGH UNIFORM VOLTAGE, EXCEPTIONALLY LONG LIFE, AND LOW COSTS. THEY ARE YOUR BEST POWER BUY—*AT ANY PRICE!*

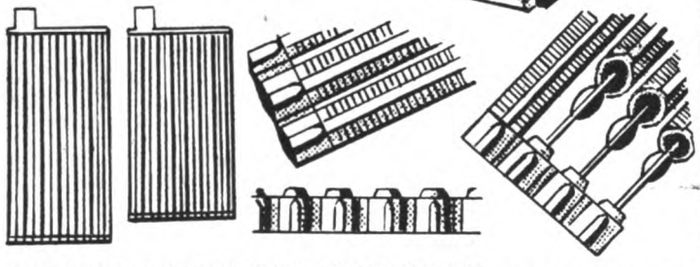
INTRODUCING... THE NEW EH EXIDE-IRONCLAD!

TO SET A NEW STANDARD FOR RAILWAY PERFORMANCE, EXIDE INTRODUCES AN ALL-NEW ENGINEERED AND FIELD-TESTED CAR LIGHTING AND AIR CONDITIONING BATTERY. THE NEW **EH**—

- DELIVERS 100% CAPACITY INITIALLY!
- ITS UNIFORM QUALITY ASSURES SUSTAINED HIGH CAPACITY DURING LONGER USEFUL LIFE!



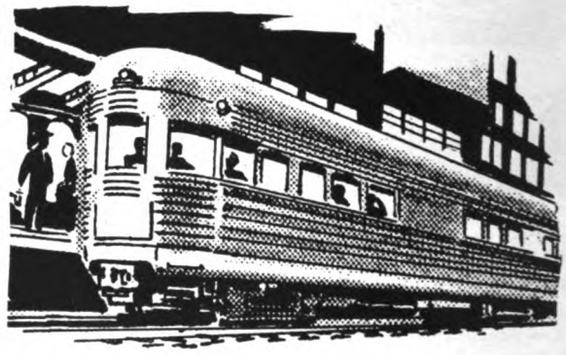
THE NEW EH HAS...



10% LONGER PLATES IN THE SAME SPACE YOU GET MORE POWER FOR A LONGER TIME!

POLYETHYLENE SLOTTED TUBES, AND SEALERS NON-OXIDIZING PLASTIC GIVES LONGER LIFE, PREVENTS SHORTS!

GRIDS WITH SILVIUM THIS NEW EXIDE NON-CORROSIVE ALLOY GIVES HIGH SUSTAINED POWER ...LONGER LIFE!



BRIGHT STEADY LIGHTS

EXIDE-IRONCLAD BATTERIES KEEP PASSENGER CAR LIGHTS BRIGHT AND STEADY... KEEP CARS COMFORTABLY AIR CONDITIONED. DEPENDABLE EXIDE-IRONCLADS ARE AVAILABLE IN SIZES AND CAPACITIES TO MEET ALL AIR CONDITIONING AND LIGHTING REQUIREMENTS.

WRITE NOW, CALL YOUR EXIDE SALES OFFICE FOR SPECIFICATIONS OF THE NEW EH. *TEST* IT YOURSELF. YOU'LL FIND THE NEW EH EXIDE-IRONCLAD IS YOUR BEST POWER BUY *—AT ANY PRICE!*

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

MOTOR WHEEL
"Center Articulated" Lid Design Gives A *Lifetime* Closure

Motor Wheel Standard and Deep Flange Lids can be removed or installed in a matter of seconds – and without tools. Time tested . . . oil and dust tight . . . full 4-way articulation. The extended housing arm facilitates raising lid, opens a full 120° for easy journal box service.

MOTOR WHEEL CORPORATION
LANSING 3, MICHIGAN U. S. A.

NATIONAL RAILWAY SALES REPRESENTATIVE

T-Z RAILWAY EQUIPMENT CO., G. S. Turner, President
8 SOUTH MICHIGAN • CHICAGO 3, ILLINOIS

NEWS

More Time to Consider Loco-Inspection Rules

Interested parties now have until November 1 to submit to the Interstate Commerce Commission their "evidence-in-chief" with respect to the commission's proposal to amend its rules and instructions for inspection and testing of locomotives other than steam.

The proposal is the subject matter of the Ex Parte 174 case, and the previous deadline for the initial filings was June 1. Under the new schedule, notices of objections to receipt of any of the evidence-in-chief will be due December 1, and rebuttal evidence will be due January 3, 1956. Requests for opportunity to cross-examine must be made (with notice to the witness involved) on or before February 18, 1956.

Edward O. Boshell

Supply Companies Organize Railway Progress Institute

Organization of the Railway Progress Institute to bring to the public full understanding of the important advantages of streamlining the nation's transportation policy was announced in Chicago May 19.

Chairman of the organization, which replaces the Railway Business Association and will work in close cooperation with the Federation for Railway Progress, is E. O. Boshell, chairman and president, Westinghouse Air Brake Company. C. L. Heater, vice-president, American Steel Foundries, was elected vice-chairman.

Members of the executive committee, in addition to Messrs. Boshell and Heater, are: Nelson C. Dezendorf, vice-president, General Motors Corporation; Lester N. Selig, chairman, General American Transportation Corporation; M. N. Trainer, vice-chairman, American Brake Shoe Company; Herbert Watt, vice-president, U.S. Steel Corporation; and R. A. Williams, president, Standard Railway Equipment Manufacturing Company.

Any company, other than a railroad, which favors conditions conducive to profitable operation of railroads under private ownership, and which is actively interested in and will support a program to improve the financial position of railroads, is eligible to join the institute.

"The new institute," the executive committee said, "will carry on a sustained effort to further the welfare of the railroad industry in the public interest—as well as advancing the legitimate concerns of railway suppliers, whose sales to railways now amount to nearly $2 billion each year. While the institute is entirely independent of the Association of American Railroads and the railroad companies, it will endeavor to harmonize its objectives with those of the railroads."

(*Continued on page 22*)

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JUNE ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Chesapeake & Ohio	40[1]	1,750	Road switching	Electro-Motive
Chicago & North Western	9[2]	1,750	Road switching	Electro-Motive
	10[2]	1,600	Road switching	Fairbanks, Morse
	3[2]	1,000	Switching	Alco Products
Green Bay & Western	2[3]	1,600	Road switching	Alco Products
Norfolk & Western	4[4]	.....	General purpose	Electro-Motive
	4[4]	.....	General purpose	Alco Products
Pennsylvania	50[5]	1,750	Road switching	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of Cars*	*Type of Car*	*Builder*
Bessemer & Lake Erie	20[6]	70-ton covered hoppers	Pullman-Standard
Chicago Great Western	50[7]	70-ton box	Thrall Car Mfg.
Missouri Pacific	1,000[8]	Box	Company shops
Norfolk & Western	500[9]	Box	Pullman-Standard
Northern Pacific	20[10]	Covered hopper	General American
Pecos Valley Southern	1[11]	Caboose	International Ry. Car
Virginian	300[12]	70-ton hopper	Company shops
Western Pacific	35[13]	Caboose	International Ry. Car
Union Tank Car Co.	200[14]	10,000-gal. tank	Company shops
	200[14]	11,000-gal. tank	Company shops
Wabash	97[15]	70-ton gondola	Company shops

FREIGHT-CAR INQUIRIES

Gulf, Mobile & Ohio	200	50-ton box	.....
Southern	1,500	Triple hopper	.....

PASSENGER-CAR ORDERS

Road	*No. of Cars*	*Type of Car*	*Builder*
Long Island	95[16]	Coaches	Pullman-Standard
New York, New Haven & Hartford	6[17]	Self-propelled	Budd

[1] For delivery: 6 in August, 16 in September, and 18 in October. Total cost, $7,500,000.

[2] Four of nine to be built by Electro-Motive and all 10 F-M units to have six-wheel trucks. Deliveries scheduled for third quarter of 1955.

[3] Estimated cost, $294,000. To have been delivered July 1.

[4] Locomotive units to cost about $1,400,000; the box cars, $3,600,000.

[5] For delivery in October and November. The new diesels, to cost an estimated $9,400,000, will be equipped with cab signals and train-phone communications equipment. They will replace 66 steam locomotives, and bring the PRR's total diesel fleet to 1,476 locomotives, made up of 2,034 units aggregating 2,811,770 horsepower.

[6] Approximate unit cost, $7,500.

[7] Approximate cost, $600,000. Deliveries expected during July and August.

[8] Authorized by U. S. District Court at St. Louis. Estimated total cost, $7,482,150. The cars will include 250 50-ton 50½-ft cars with loading devices and 8-ft doors; 300 50-ton 50½-ft cars; 350 50-ton 40½-ft cars; and 100 50-ton 50½-ft cars with 15-ft doors for special loading purposes. Delivery will begin in September and be completed early in 1956. The court also authorized conversion of 523 open-top hopper cars to covered hoppers at a cost of $1,673,600.

[9] To cost about $3,600,000.

[10] Estimated unit cost of these Airslide cars, $11,790. To be delivered before end of third quarter of this year. The NP's Brainerd, Minn. shops have just recently finished converting 50 steel-sheathed box cars to damage-free cars at an estimated cost of $2,166 per car.

[11] Estimated cost, $14,500. Delivery expected in September.

[12] Estimated cost, $2,000,000. Deliveries expected during November and December.

[13] These bay-window cabooses, to cost approximately $500,000, will have roller bearings and high-speed trucks, cushion draft gears, electric lights, radio communication with locomotives and dispatchers, and modern sanitary facilities. Delivery is expected late this year. The cars are the last to be ordered of 355 units authorized by the directors.

[14] For delivery late this year.

[15] Delivery scheduled for September and October.

[16] This order, plus a 1954 order for 125 cars, on which deliveries have just begun, will give the LI a total of 220 new cars, divided as follows: For non-electrical lines—80 coaches; for electrified lines—22 head-end m-u cars, with motors and controls, 74 "mid-train" m-u cars, with motors but without controls, and 44 m-u trailer cars, with neither motors not controls. In addition, the road has one new Budd RDC in service, and another on order. This second installment of new cars will be built at the Worcester, Mass., plant of the Pullman-Standard Car Manufacturing Company. Under the present delivery timetable, the last seven of the 125 first-order cars will be completed by Pullman-Standard the week of November 21 and the first eight of the 95-car order will be delivered the week of December 5. In addition, there will be two self-propelled Budd cars, one of which already is in service between Babylon and Southampton. Equipped with eight-ton electro-mechanical air-conditioners, the new cars now being delivered will seat 120 passengers in specially designed reversible-back seats. They will have continuous fluorescent lighting, rubber tile floors, overhead parcel racks, coat hooks at seat locations and grab handles on the aisle side of seats.

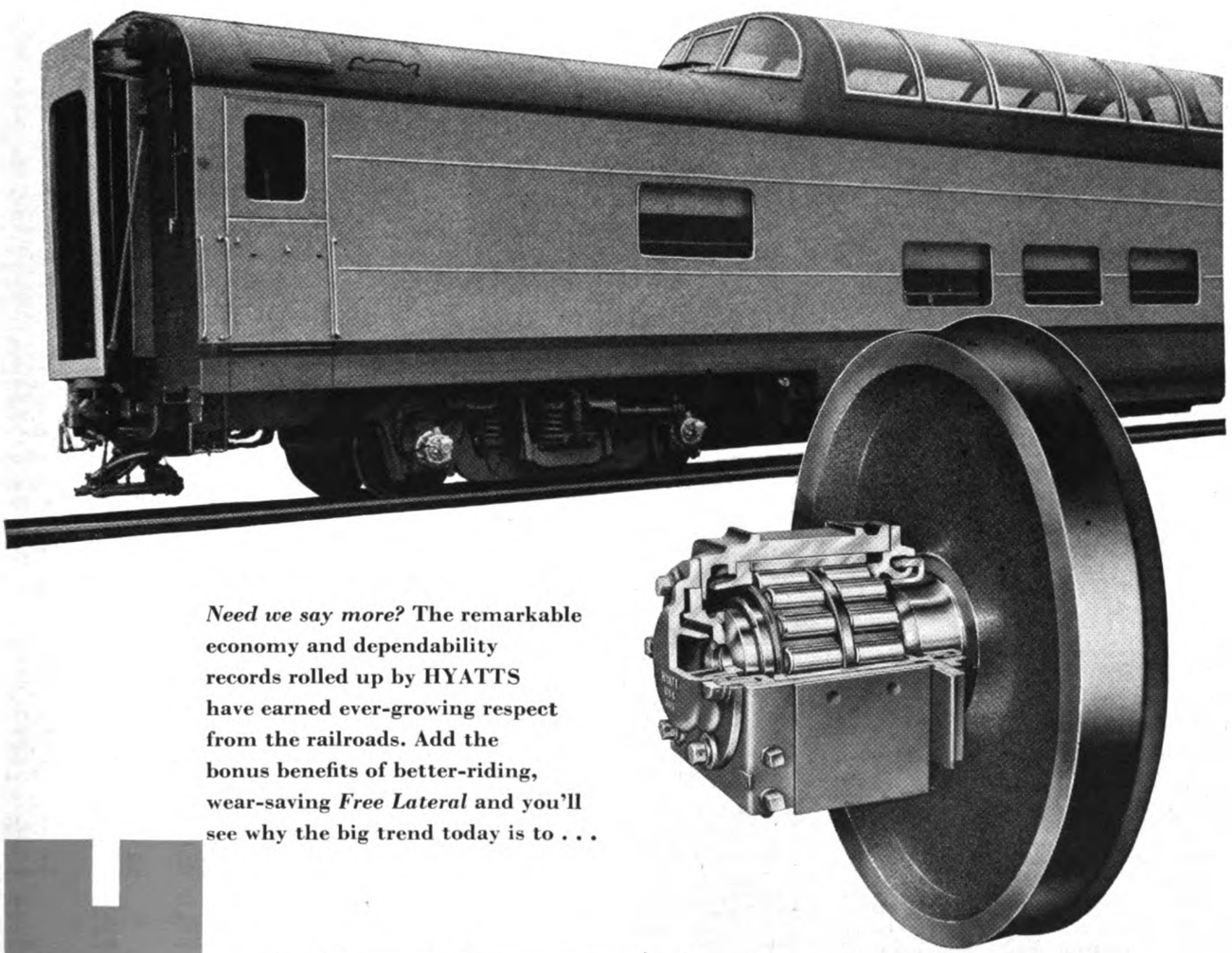
[17] Purchase of a third high-speed streamline train has been authorized by the New Haven's board of directors. It will be built by the Budd Company at a cost of $1,200,000, and is to be ready for delivery in the spring of 1956. The train—which is in addition to those previously ordered from the Pullman-Standard Car Manufacturing Company and ACF Industries (*Railway Age*, April 4, page 8)—will be six cars long and seat 468 passengers. It is a modification of Budd's rail diesel cars. Each car will be self-propelled by two 300-hp diesel engines, with torque converter drive under each car. An engineer's cab will be at each end of the train, eliminating the need to turn. The problem of third-rail electric power for Grand Central Terminal, New York, will be solved by providing contact shoes on each car which can supply power for special d-c motors on the idler axles of each car. An innovation in the train will be the placing of the cooling housing in the side walls of each car rather than on the roof.

NOTES:

Boston & Maine.—The B & M has announced a modernization program which includes rebuilding 500 box cars at its Concord, N. H., shops.

Long Island.—The Long Island has been authorized by its directors to buy 10 diesel locomotive units, which, when received, will end all use of steam power on the railroad.

IN 1954 67% OF THE ROLLER BEARING JOURNAL BOXES ORDERED FOR NEW U. S. RAILROAD PASSENGER CARS WERE HYATTS



Need we say more? The remarkable economy and dependability records rolled up by HYATTS have earned ever-growing respect from the railroads. Add the bonus benefits of better-riding, wear-saving *Free Lateral* and you'll see why the big trend today is to . . .

HYATT

ROLLER BEARING JOURNAL BOXES

RUNNING MATE OF FASTER FREIGHT

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

NEWS

(*Continued from page 14*)

Announcement of the organization of the RPI was greeted with statements of approval, by railroad executives.

RDC's Complete Long High-Speed Test Run

A train of three Budd rail-diesel cars—two of the RDC-1 full-coach type and one combine car of the RDC-2 type—successfully completed a high-speed test trip on the Baltimore & Ohio from Washington to Chicago May 28.

At an average overall speed of 61.4 mph, the special train made the 768-mile run in 12 hr 29 min—three hours faster than the 15½-hr schedule of the "Capitol Limited," the B&O's fastest regular train between the two cities.

The return trip was made May 30; because of a different routing through Pittsburgh and a dinner stop at Cumberland, Md., the elapsed running time was lengthened to 12 hr 40 min.

No special preparation of equipment was made for the run; the cars had been in regular commuting service until the day previous, when they were withdrawn and assigned to the special schedule, which had been tentatively set at 13 hr from Washington to Chicago. They were returned to regular service May 31.

The trip was sponsored by the railroad to provide information on the practicability of using RDC's for fast daylight runs between Washington and Chicago, Philadelphia and Pittsburgh, and possibly other cities served by the B&O—which has under way tentative plans for RDC cars with observation dome and dining facilities for such "middle-distance" services.

The special train carried 214 passengers, most of whom were members of the Washington chapter of the National Railway Historical Society.

Westbound crews were changed at Cumberland, Pittsburgh and Willard, Ohio, while the cars were fueled and watered at the same short stops. Supervisory enginemen ran the train most of the way.

N. Y. RR Club Announces Seventh Essay Contest

The New York Railroad club has announced its seventh consecutive yearly essay contest. First prize will be $750; second prize, $500; and third prize, $250. All essays should be in the hands of John Burry, executive secretary of the club, 30 Church street, New York 7, N.Y., on or before next October 1.

Suggested subjects are: Argue for or against any or all recommendations made by President Eisenhower's Advisory Committee on Transport Policy and Organization; changes in rates and service to improve railroad traffic volume and net earnings, including essayist's views on improving the competitive position of railroads; what railroads can do to improve their system of recruiting selecting and training personnel, including management per-

(*Continued on page 26*)

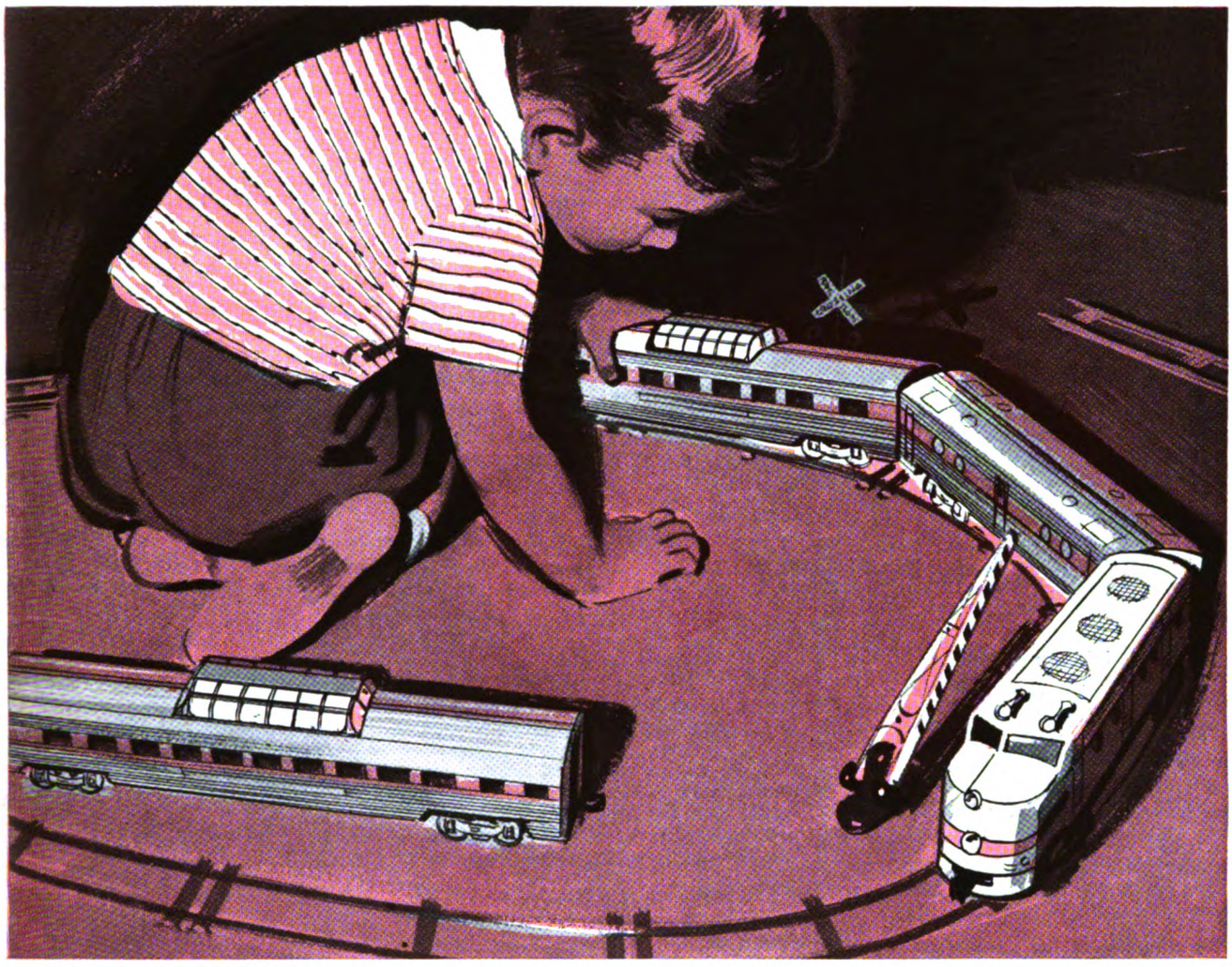
SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
March, 1951	3,063,173	3,667	10,078	13,745	222,857
March, 1952	2,943,812	2,594	5,877	8,471	347,517
1953					
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,7933	63,197

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of March		3 months ended with March	
		1955	1954	1955	1954
	Freight Service (Data from I.C.C. M-211 and M-240)				
3	Road locomotive miles (000) (M-211):				
3–05	Total, steam	4,998	6,513	14,427	21,081
3–06	Total, Diesel-electric	35,402	32,458	101,262	92,608
3–07	Total, electric	746	669	2,078	1,906
3–04	Total, locomotive-miles	41,348	39,721	118,373	115,820
4	Car-miles (000,000) (M-211):				
4–03	Loaded, total	1,638	1,502	4,631	4,351
4–06	Empty, total	913	882	2,630	2,560
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6–01	Total in coal-burning steam locomotive trains	11,321	12,268	32,297	39,776
6–02	Total in oil-burning steam locomotive trains	1,279	1,998	3,694	7,111
6–03	Total in Diesel-electric locomotive trains	99,023	88,561	281,190	252,979
6–04	Total in electric locomotive trains	2,268	2,067	6,272	5,794
6–06	Total in all trains	114,550	105,176	325,462	306,431
10	Averages per train-mile (excluding light trains) (M-211):				
10–01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.02
10–02	Loaded freight car-miles	42.40	40.40	41.90	40.20
10–03	Empty freight car-miles	23.60	23.80	23.80	23.70
10–04	Total freight car-miles (excluding caboose)	66.00	64.20	65.70	64.00
10–05	Gross ton-miles (excluding locomotive and tender)	2,965	2,832	2,943	2,836
10–06	Net ton-miles	1,320	1,238	1,311	1,247
12	Net ton-miles per loaded car-mile (M-211)	31.10	30.60	31.30	31.00
13	Car-mile ratios (M-211):				
13–03	Per cent loaded of total freight car-miles	64.20	63.00	63.80	63.00
14	Averages per train hour (M-211):				
14–01	Train miles	18.90	18.90	19.00	18.90
14–02	Gross ton-miles (excluding locomotive and tender)	55,391	53,123	55,268	52,988
14	Car-miles per freight car day (M-240):				
14–01	Serviceable	45.50	41.40	44.60	41.40
14–02	All	42.70	39.30	41.80	39.40
15	Average net ton-miles per freight car-day (M-240)	853	758	835	767
17	Per cent of home cars of total freight cars on the line (M-240)	49.40	54.90	50.90	54.00
	Passenger Service (Data from I.C.C. M-213)				
3	Road motive-power miles (000):				
3–05	Steam	1,451	2,554	4,134	7,888
3–06	Diesel-electric	20,607	21,153	60,889	61,444
3–07	Electric	1,371	1,443	4,059	4,263
3–04	Total	23,430	25,151	69,084	73,596
4	Passenger-train car-miles (000)				
4–08	Total in all locomotive-propelled trains	236,394	249,569	694,359	734,414
4–09	Total in coal-burning steam locomotive trains	8,330	13,162	24,042	40,951
4–10	Total in oil-burning steam locomotive trains	3,537	7,812	9,977	24,095
4–11	Total in Diesel-electric locomotive trains	208,446	212,408	613,602	621,640
12	Total car-miles per train-miles	9.70	9.54	9.68	9.61
	Yard Service (Data from I.C.C. M-215)				
I	Freight yard switching locomotive-hours (000):				
1–01	Steam, coal-burning	261	323	737	1,019
1–02	Steam, oil-burning	43	55	122	161
1–03	Diesel-electric[1]	3,580	3,347	10,234	9,727
1–06	Total	3,892	3,738	11,115	10,940
2	Passenger yard switching hours (000):				
2–01	Steam, coal-burning	10	13	30	41
2–02	Steam, oil-burning	4	4	14	13
2–03	Diesel-electric[1]	249	259	736	764
2–06	Total	291	305	857	901
3	Hours per yard locomotive-day:				
3–01	Steam	4.80	4.60	4.70	4.80
3–02	Diesel-electric	15.50	15.20	15.30	15.20
3–05	Serviceable	15.30	14.40	15.10	14.50
3–06	All locomotives (serviceable, unserviceable and stored)	13.20	12.30	13.00	12.40
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.65	1.73	1.66	1.74
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.76	.76	.76	.76

[1] Excludes B and trailing A units



A railroad that doesn't use Adlake equipment?

Sure—this one!

But even *this* railroad is influenced by ADLAKE PRODUCTS.
That Dome car, for example, is modeled after the revolutionary designs using Adlake Dome Windows that have put a new "see" into sight-seeing.

It's true we don't make equipment for model railroading, but *every* major American railroad uses the famed Adlake "Breather" windows. And if you take inventory on any railroad, you're sure to find Adlake hardware, luggage racks, curtains, switch locks, signal lamps, lanterns and other specialties for the railroad industry. We're proud of the customer friends we've made in our 98 years of growth with America's railroads!

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Established 1857 • ELKHART, INDIANA • New York • Chicago

Adlake 98th year
of serving the transportation and building industries

Manufacturers of ADLAKE Specialties and Equipment for the Railway Industry

NEWS

(Continued from page 22)

sonnel; what can be done to improve the quality of the railroads' freight-car fleet, including discussion of improved methods of acquisition and financing and the assurance of an adequate supply of high-grade equipment at all times.

Contestants are not limited to suggested topics; but if they wish to submit an essay on another topic, written approval should first be obtained from the club's contest committee.

Miscellaneous Publications

1955 SURVEY OF DIESEL-ELECTRIC MOTIVE POWER IN RAILWAY SERVICE AND NEW 1954 INSTALLATIONS OF DIESEL-ELECTRIC MOTIVE POWER. Simmons-Boardman Publishing Corporation (publishers of *Railway Locomotives and Cars*), 30 Church street, New York 7. 20-page copyrighted survey. Price, $5 per copy; quantity rates on larger orders. This survey includes, for the first time, an inventory of each diesel builder's locomotives in service on each of 174 railroads in the United States, Canada and Central America. It shows "(1) how many of any builder's locomotives were installed by a given road during 1954, and (2) how many of X's locomotives were on the property at the end of the year," itemized both by unit and horsepower. The data covers over 26,000 locomotive units with a total horsepower of over 35.6 million.

■

SPECIFICATIONS FOR CORROSION-RESISTING CHROMIUM AND CHROMIUM-NICKEL STEEL COVERED WELDING ELECTRODES. American Welding Society, 33 West 39th street, New York 18. 13-page pamphlet. Price, 40 cents. Eight new classes of electrodes—two extra low carbon grades (E308ELC and E316-ELC), two columbium grades (E309Cb and E310Cb, two molybdenum grades (E309Mo and E310Mo), and grades E312 and E318—have been added to this revised edition issued jointly by the American Welding Society and the American Society for Testing Materials. These additions cover the recently developed electrodes which have widened the range of stainless steels, clad steels and dissimilar metals that can now be successfully welded. Details are given on test methods, weld metal composition requirements, standard sizes and lengths, packaging and color markings for identification. An appendix aids in selecting the electrode class best suited for a particular application.

PERSONAL MENTION . . . . . .

Baltimore & Ohio

J. A. F. CRAIG, appointed master mechanic at Chicago.

G. W. SHORT, master mechanic at Chicago, retired.

Central of Georgia

DAVID H. NOBLE, appointed electrical engineer. Headquarters, Savannah, Ga. Formerly traveling electrical foreman of Atlantic Coast Line.

Chicago, Burlington & Quincy
Aurora, Ill.

N. J. BRICHER, superintendent of shops retired.

C. C. CORNEILS, assistant superintendent of shops, appointed superintendent of shops.

F. W. DUNNING, engineer of tests retired.

R. A. BOERKE has been appointed engineer of tests.

Chicago, Milwaukee, St. Paul & Pacific

E. L. GROTE, master mechanic at Minneapolis, appointed assistant superintendent motive power at Milwaukee.

Chicago, Rock Island & Pacific

ERNEST L. NYLANDER, assistant superintendent, appointed superintendent car department at Chicago.

Missouri-Kansas-Texas

C. H. DICK, general master mechanic at Denison-Ray, Tex., has had jurisdiction extended over Denison Depot car department and all locomotive and car departments south to Waco-Bellmead, Tex., including De-Leon sub-division, Stamford sub-division, Northwestern division, and Beaver, Meade & Englewood Railroad.

G. E. STEPHENSON, appointed master mechanic, with jurisdiction over all locomotive and car departments north of Parsons, Kan. Headquarters, Franklin, Mo.

H. C. VINSANT, appointed master mechanic with jurisdiction over Parsons (Kan.) locomotive and shop order shops. Headquarters, Parsons.

F. H. CRANK, appointed master mechanic, with jurisdiction over Parsons (Kan.) car department and all locomotive and car departments south to Denison, Tex. Headquarters, Muskogee, Okla.

J. L. ROUCH, appointed master mechanic at Waco, Tex., with jurisdiction over Warden shop, Bellmead car department, and all locomotive and car departments south to San Antonio, Tex., and Galveston.

R. D. WALTHALL, JR., appointed assistant master mechanic. Headquarters, Waco, Tex.

R. E. BURRIS, appointed assistant master mechanic. Headquarters, Parsons, Kan.

Norfolk & Western

O. H. JENNINGS, car foreman at Crewe, Va., appointed assistant car foreman at Lamberts Point, Va.

J. L. OAKEY, gang foreman, freight car shop at Roanoke, Va., appointed car foreman at Crewe, Va.

T. M. NEWMAN, gang foreman, Shaffers Crossing (Va.) car department, transferred to position of gang foreman at Roanoke (Va.) freight car shop.

J. M. CUNNINGHAM, gang foreman, Portsmouth, Ohio, car department, appointed gang foreman, Shaffers Crossing (Va.) car department.

C. M. WILSON, gang foreman at Bluefield, W. Va., appointed gang foreman, Portsmouth, Ohio, car department.

E. A. MANETTA, personnel assistant, appointed assistant superintendent motive power—personnel at Roanoke, Va.

Norfolk Southern

Melvin B. Dowdy

M. B. DOWDY appointed superintendent motive power and equipment, Carolina shops, Norfolk, Va., as announced in the May issue. *Born:* January 6, 1917, at South Norfolk, Va. *Career*: Began as carman apprentice March 17, 1936, later serving successively as air-brake mechanic; chief mechanical inspector; assistant to chief mechanical officer, and assistant chief mechanical officer.

Northern Pacific
St. Paul, Minn.

F. G. MOODY, superintendent of car department, retired.

H. E. BRAKKE, assistant superintendent of car department, appointed superintendent of car department.

G. A. WEBSTER, general car inspector, appointed assistant superintendent of car department.

D. S. ROY, assistant general air brake inspector, appointed general car inspector.

E. R. MANOR, assistant general mechanical superintendent, retired.

W. R. SHANNON, assistant to general mechanical superintendent, appointed assistant general mechanical superintendent.

(Continued on page 90)

EDITORIALS

The Wrong Direction

Two bills have been introduced in the Senate in the past few months that are of more than ordinary interest to the railroad man and to his future welfare. While neither bill concerns the mechanical department directly they can both readily set a pattern easily adaptable to mechanical operations. The first bill would prescribe minimum standards of training and experience for operating personnel of railroads. The second bill would prescribe minimum standards of safety for track, bridges and related facilities.

Both of these bills will no doubt be advocated as a safety measure by their supporters. Yet the underlying motives of both appear to concern matters other than safety. The first could, of course, be easily written to handicap supervisory personnel in the operation of trains during a strike. The second would prevent curtailing maintenance and large scale layoffs during lean periods.

The first objective will of course be judged good or bad depending on which side of the labor-management fence you are on. The second objective is something no one will quarrel with as greater stabilization of employment is an advantage to all. But is this the way to go about it?

An indirect approach is always inferior to a direct approach. Using safety as a mask to attain another objective is difficult to defend. Another thing hard to defend is using something as rigid as a law to meet a flexible and changing problem. All too often a law is passed because a temporary condition focuses public interest on some subject. Times and technology change, but the law stays the same. It becomes obsolete. The same interest that caused the law to be passed in the first place does not recur when a mere change is needed. Witness the many regulations under which railroads operate today—regulations that were desirable when passed, but which handicap the industry today.

There is the further problem of adapting one set of rules to all parts of the country unless they are made so general as to be meaningless. A maintenance rule that would be sensible for a heavy duty high speed main line condition in the east would be likely to be rather silly for a light branch line in the west.

Railroads are a frequent target for regulators. Whether the reasons for this are adequate or logical is not important. The fact remains that the industry is vulnerable to regulations which are often harmful to it. It would therefore seem to be to the best interests of all railroadmen to learn the nature of any future proposed regulations and to be able to intelligently oppose them. Because, when such rigid regulations become—as they usually do—obsolete with time, they become bad for the railroads, for the public and for all the employees, even those who may have once been temporarily benefited.

Service or Scrap . . . Nothing Else to Sell

"Railroads have only two things for sale—service and scrap." In the efforts necessary to sell today's railroad service, the car department holds a front line position according to Roy E. Baker. The Maine Central's general manager—mechanical outlined the competitive demands on the car department before a recent meeting of the Eastern Car Foreman's Association.

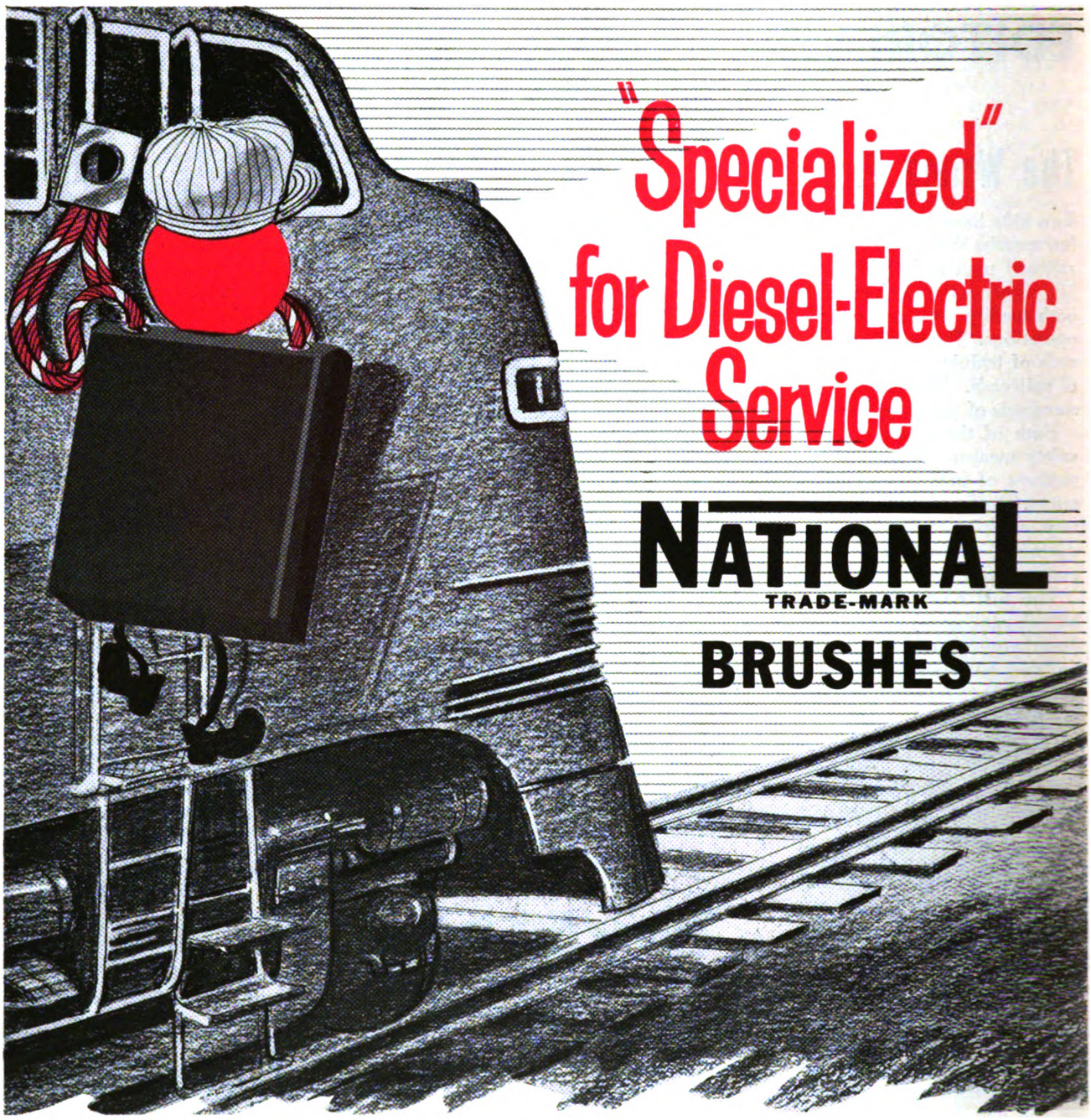
Shippers today are demanding freight cars designed and conditioned for their needs. Subsequent proper loading of these cars is the result of education and inspection. Little things "unsell" passengers. Lack of cups and towels in coaches can undo all the results obtained with expensive modern equipment and service. Properly serviced passenger cars and adequate freight cars, safely loaded, must be operated so their performance matches that of competitors. This type of operation is only possible with good car-department maintenance. Moreover, it is only possible when there is cooperation between all departments. Adequate tools and properly trained people are essential.

Mr. Baker outlined the importance of good personnel relations on output. Safety resulting from methods and equipment is vital. Training at all levels is very important. A program should produce men not only better able to do today's job, but also skilled in probable future positions.

Tomorrow's methods must be considered along with tomorrow's men. More modernization is essential. Facilities and cars must be designed to meet even more extreme demands. Methods and tools should constantly be studied so that work can be speeded.

"It behooves us," Mr. Baker concluded, "to do our very best to further improve and simplify interchange of traffic, study for better and more economical maintenance of equipment in daily operation, and strive for improvements in shop practices for repairing cars."

Mr Baker's summary avoids the mention of car design. Shippers must have a large part in determining the specifications for future cars. Customers, and not the operating department, will dictate the special features, sizes and type of cars if the railroads are to sell their service. The economy of train load handling means little to a shipper whose only direct contact is with the complex packaging and dunnage that make it possible. Highway competition handles small loads with very little special packing. Complex and specialized car arrangements are necessary to make possible high-speed heavily loaded trains that can handle their loads without damage.



DIESEL-ELECTRIC traction motors, generators and auxiliaries involve a combination of service conditions not duplicated in other types of electrical rotating equipment. That's why National Carbon engineers have consistently worked toward specialization of "National" brushes for diesel locomotives.

First, they set about duplicating road-service conditions in the laboratory. Next, they took the product of this continuing research to the railroads themselves. Cooperating with these railroads and with equipment manufacturers, National Carbon has developed a complete line of brush grades *specifically* designed for locomotive service.

• • •

This specialization program has resulted in much longer brush life, improved commutator condition and lower maintenance costs. This explains why far more "National" brushes are used in diesel-electric locomotive applications than all other brands combined! Find out for yourself the easy way. *Try 'em!*

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation.

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IN CANADA: Union Carbide Canada Limited, Toronto.

New Books

THE DILWORTH STORY. By Franklin M. Reck. Railroad men who have known and had dealings with Dick Dilworth over the past 20 or 25 years will have many a chuckle over this story. The author has missed no opportunity to portray Dilworth in all the color and saltiness of his personality.

Dilworth, the engineer who guided the development of diesel-electric locomotives for road service into the direction of standardization for assembly-line production, was a self-educated man, with but one-half day of formal education in his whole life. He was by no means devoid of book learning, however. Born in Seattle, Wash., in 1885, the son of a frontier Presbyterian minister, his early education was such as his parents were able to give him at home. Then, after he had run away from home at the age of twelve, he became a foot-loose wanderer. He went to sea; among other jobs he worked as a machinist; for a while he was a telephone lineman. When he was 18 he enlisted in the navy as an electrician and, after some four and a half years, was discharged as a chief electrician.

When he was 24 he was hired by the General Electric Company as a machinist. From that time on he was associated with some phase of the development of automotive type motive power for American railroads.

How a boomer machinist acquired the knowledge required by the chief engineer of the Electro-Motive Division of the General Motors Corporation is illustrated by an incident which occurred on his first job as a machinist. Hired on his own optimistic appraisal of his attainments, he discovered that he would have to know trigonometry to use a machinist's handbook and that he would have to know arithmetic and algebra to understand trigonometry. He never studied anything for which he had no immediate use, but never hesitated to go back and start with the fundamentals on any problem with which he was confronted.

Mr. Reck gives a complete account of Dilworth's accomplishments as an engineer and illustrates his forthright method of dealing with men at all levels with many incidents and anecdotes. But in setting forth Dilworth's accomplishments he has tended toward over inclusiveness. Electro-Motive and Dilworth, then its chief engineer, assumed the responsibility for the design of an articulated rail motor car which was delivered to the Santa Fe early in 1932.

"Up to this time," says the author, "common railroad practice called for attaching the brake cylinder to the bottom of the car. However, on the distillate power car, it was necessary to have the fuel tank attached to the bottom . . .

"So Dilworth conceived the idea that the large brake cylinder should be broken up into small cylinders and 'draped around the truck as close as possible to the brake shoes on the driving wheels.' " It seems that Electro-Motive and Mr. Dilworth had some trouble in selling this solution to the customer. The idea, itself, however, had already been developed by the American Steel Foundries and applied to the tender trucks on an order of 4-6-4 type steam locomotives built a year or more earlier and it was this company's Unit Cylinder clasp-brake design which was applied to the trucks of the Santa Fe rail car.

As a review of a period of tremendous importance in the history of railway motive power the book is not complete. As the story of an unusual personality, whose part in one aspect of motive-power development is known to many men in railway service today, the reader is not likely to be disappointed.

McGraw-Hill Book Company, New York. Price $3.00.

Letter To the Editor

Should Locomotive Costs Be Measured by the Mile?

TO THE EDITOR:

In the May 1955 issue of *Railway Locomotives and Cars*, there is an editorial entitled "Are We Kidding Ourselves," having to do with the cost of maintaining diesel locomotives.

Those who are trying to sell electrification to the railroads have made the same assumptions that your editorial writer did—that there is a constant rise in the unit-mile cost of maintaining diesel locomotives. We have taken exception to that theory, and believe have pretty definite proof that it will not stand careful examination.

In the first place, diesel locomotives have been purchased in large quantities during a period of inflation. It is necessary to reduce costs to a fixed value of money in making comparisons over the life of a diesel. In the second place, an analysis of carefully kept figures on a unit basis for 92 F-T EMD diesel locomotives gives definite indication of a cycle in repair costs per unit-mile, depending to some extent on the severity of the use to which the diesel locomotive is subjected.

We made heavy repairs to these locomotives after about an eight-year life. In the following year the cost of repairs per unit-mile dropped back to about the same level as that attained in their third year of life, which was slightly higher than the repair cost for the locomotives when they were new. Considering the way our fleet was built up over a period of years, we anticipate that the same cycle will apply to each group of locomotives and our repair costs per unit-mile will level off.

There is a third factor that must be considered—is the unit-mile the proper measure for considering maintenance on a diesel? Perhaps, a better figure to use would be the number of gallons of fuel consumed which measures not only mileage but also the percentage of the total power being used. This calls for a different approach to maintenance considerations than was used with steam locomotives.

I cannot quarrel with the main theme of the editorial, which is that the railroads should not close their eyes to the economic justification for replacement of locomotives as compared with continual repairing of locomotives.

John M. Budd
President, Great Northern

Here's why you get

LOWEST TON-MILE COST

with solid-bearing freight cars

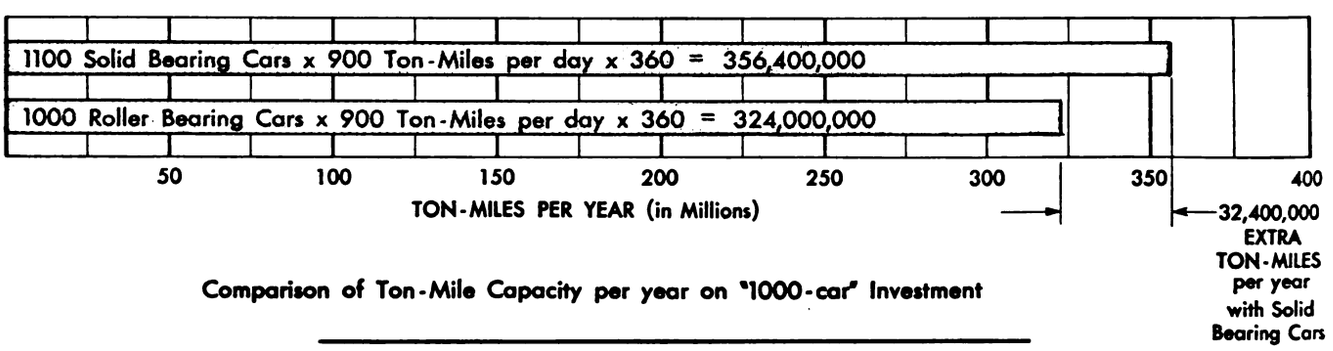
Projection of ton-mile costs as related to initial investment shows big economic advantage for solid bearings — even without any allowance for roller bearing maintenance or operating costs.

You can buy up to 10% more hauling capacity per dollar when you specify solid bearing cars. That means up to 10% more gross ton-miles of revenue, *and the lowest net ton-mile costs for operation!*

To illustrate: For the price of 1,000 roller bearing cars you can buy 1100 solid bearing cars. Make due allowance for all solid bearing operating costs on 1100 cars (you don't even have to consider the roller bearing failure, maintenance and operating costs) and you earn at least $250,000.00 per year more on your solid bearing car investment.

But suppose you don't need the 100 extra cars? Then you reduce your initial investment by $600,000.00 and get the same increased return per dollar represented by the $250,000.00 above — the same overall reduction in costs per ton-mile of operation.

Look at it another way: All your true maintenance costs for solid bearing assemblies will come to less than the interest and depreciation on the cost of rollers. That's positive assurance your overall ton-mile costs are lowest with low-cost solid bearings.*



Comparison of Ton-Mile Capacity per year on "1000-car" Investment

Still lower costs per ton-mile available

Real savings in ton-mile operating costs can be made with R-S Journal Stops and Satco lining metal. Journal Stops improve bearing lubrication, add to bearing life, and eliminate waste grabs. If all cars in a consist were journal-stop-equipped *the train could move to destination without attention to journal boxes.* Oiling could be on a periodic basis.

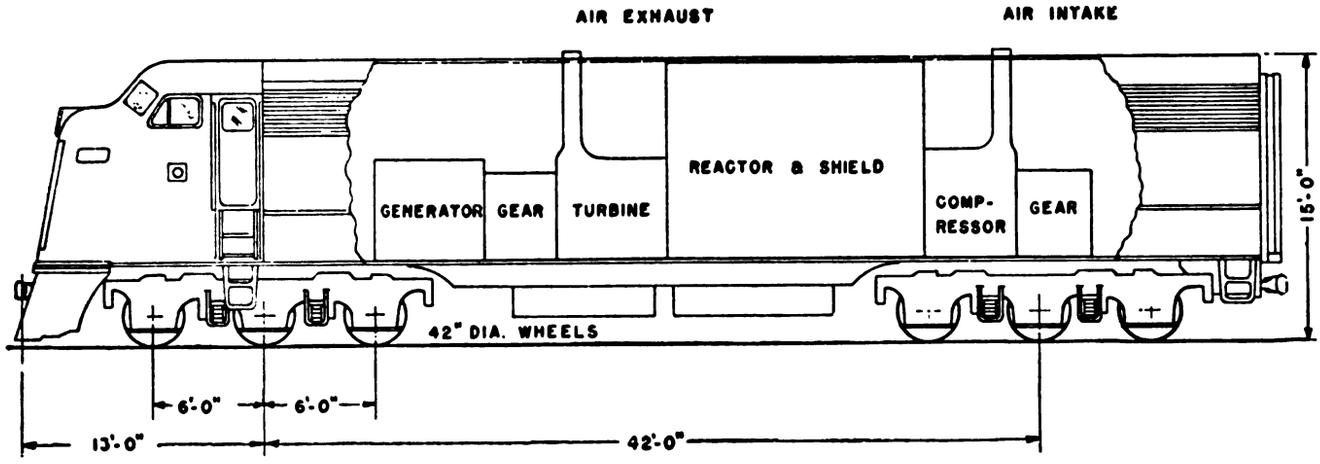
And bearings run cooler with Satco lining. You get lower operating temperatures, higher oil viscosity and a thicker film of oil. Write us for complete information on Journal Stops and Satco. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 East Jackson Blvd., Chicago 4.

MAGNUS

Solid Bearings

* *Comparative economic studies available on request.*

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**



Section of an all-purpose atomic locomotive, the shape of which could be modified for yard service. Total length of the locomotive is 68 ft.

An Atomic Gas-Turbine Locomotive

If the military will build the first one, it will provide itself with a valuable asset and will make an important step toward wider application

An atomic-powered, gas-turbine-electric locomotive, built by the military service was proposed by Bruce C. Gunnell, chief mechanical engineer, Southern, at a meeting of the Atomic Industrial Forum, held in New York on May 23-24, 1955.

In outlining the reasons for his proposal, Mr. Gunnell spoke, in part, as follows:

"The American railroads are interested in atomic energy in a general way, because anything that affects industry, also reacts on the transportation business, but our primary interest is in the use of atomic energy to furnish the power to haul our trains, at a lower over-all cost than is being done by our present equipment.

"This may be accomplished by using atomic power in one of two ways, indirect or direct. If the indirect is used, the atomic energy would be converted into electrical power at stationary plants and transmitted through overhead lines to conventional electric locomotives. This is a very feasible way to use atomic energy but at the present time, I do not believe the electric locomotive with all its overhead wires, and other parts of its transmission system, can compete with the diesel locomotive even if the electric power, produced by atomic energy, could greatly reduce our present electric cost.

"This is the picture as I see it today, but if the cost of present day diesel fuel continues to increase so as to become prohibitive for railroad use, it is likewise possible to see a different picture with regard to the electric locomotive.

"I mentioned the use of atomic energy in a direct method on a railroad locomotive. This would mean that the atomic fuel would be carried in the locomotive and converted into power on this unit.

"At this point it would be well to define a locomotive in general terms. A locomotive is an engine which converts fuel or electric power into tractive force at the rails.

"The coal or oil fired reciprocating steam engine has definitely proved itself to be inefficient from a fuel cost, maintenance cost and availability standpoint.

"In my opinion, the steam non-condensing turbine, directly connected, or electric driven locomotive is in the same category as the reciprocating steam locomotive, with an additional disadvantage of being so large that it is only usable in heavy mainline service. If a condensing unit is used, in an effort to save water, the locomotive would be so large that it would be useless on most railroads.

"The internal combustion (diesel) electric locomotive is the most economic and versatile of all modern locomotives. A diesel-electric locomotive can be made up of one to six, 1,500 to 2,400-hp single units, weighing about 250,000 lb each, with all weight on drivers. Such a locomotive can be used in yards or on branch and main lines.

"The other type of locomotive which seems to be showing some promise in recent years, is the gas turbine-electric. This type unit is only in its early stages of development and road tests, and so far it does not com-

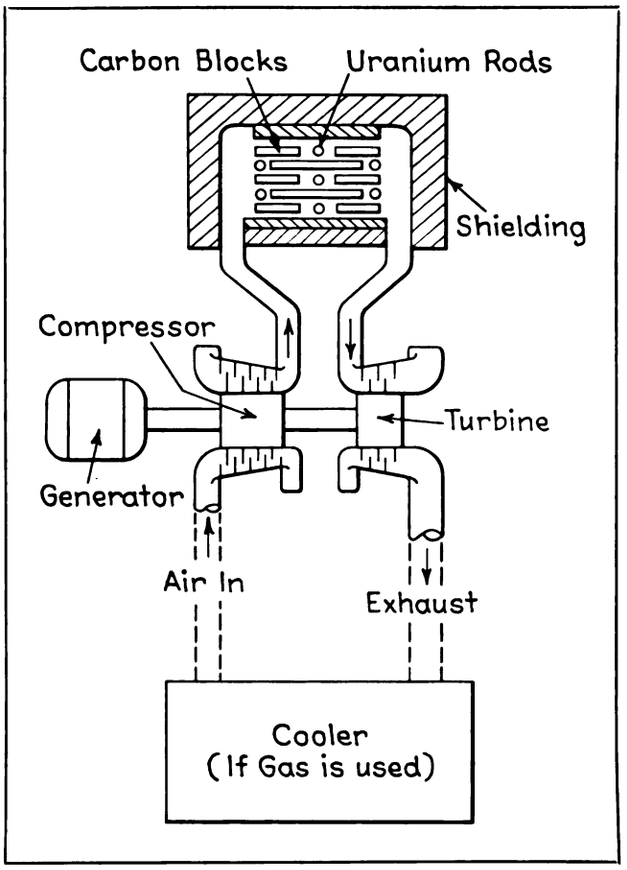


Fig. 1—Air or gas cooled reactor and gas turbine for power generation.

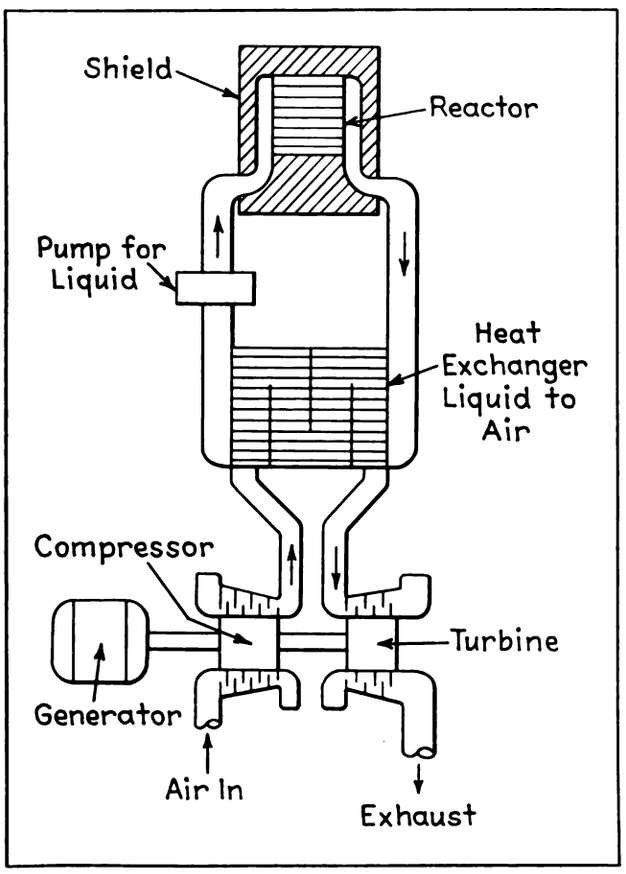


Fig. 2—Liquid cooled reactor and gas turbine for power generation.

pare favorably with the diesel-electric locomotive. It can be made into units of comparable size and weight to the diesel, which is one of its good points. Impurities in the fuel which damage the blades and low efficiency at less than full load output are two of the main disadvantages.

"A few of the important points a locomotive should have are as follows:

1. Economic fuel consumption.
2. Such size and weight that it can be used as a switching unit in yards, or coupled in several multiple units, with single control operation, for use in branch or main line service to pull heavy trains at fast speeds.
3. Require a minimum of maintenance cost, and out-of-service.
4. Simple to operate with a minimum operating crew.
5. Total original cost and operating cost should be kept to a minimum.
6. Last but not least a top priority requirement is that the locomotive be safe under normal and abnormal operating conditions.

"Our interest at this time is the potential use of atomic power by a railroad locomotive. Atomic fuel has a great deal more heat per pound, than do our present types of fuel, as can be seen by the following table:

Fuel	*Btu per lb*
Wood	8,000
Coal	14,000
Oil	20,000
Uranium 235	40,000,000,000

"From this, it can be seen that atomic energy has quite a potential possibility in the power field, assuming its present cost will be reduced as its use increases.

"As has been shown, an atomic energy source will generate heat. This heat can be used to generate steam or to heat gas (air) for use in an engine or turbine.

"Our next step now is to see in which type of locomotive this heat can best be used.

"The conventional steam-reciprocating locomotive has such low efficiency and availability, I think it should be disregarded. The efficiency of this locomotive is usually seven per cent or less.

"The diesel-electric internal combustion locomotive is the highest in efficiency, about 28 per cent, the highest in availability of all locomotives at present, but an internal combustion engine does not seem to be adapted to the use of atomic energy.

"The steam turbine-electric has not proven itself to be satisfactory for locomotive use, even though much effort has been exerted to develop this type of power. The efficiency does not seem to be much above the steam reciprocating locomotive and among other disadvantages, it requires a large volume of water. The use of a condenser has never proven satisfactory on a locomotive, so I would recommend against considering this type of locomotive for use of atomic power.

"This leaves us the gas-turbine-electric locomotive to consider. The efficiency of this type locomotive is approximately 18 per cent, with a turbine blade temperature of 1,300 deg F, and its availability should be high. The use of atomic energy to heat a gas, say—air, for the turbine seems possible, and I recommend we consider this type locomotive as being the most likely for this use.

"If we take a gas-turbine-electric locomotive adapted to

TABLE I

	Data	Diesel	Atomic
1.	Locomotive efficiency (per cent)	28	16
2.	Fuel per mile (average)	28 lb (4 gal)	.000,0245 lb
3.	Total fuel capacity lb (estimated)	14,000 lb	33 lb (15 kg)
4.	Locomotive miles per month (estimated)	12,000	12,000
5.	Locomotive miles per year (Item 4 x 12)	144,000	144,000
6.	Portion of total Btu's used per fueling, per cent (estimated)	100	20
7.	Pounds used per fueling (Item 3 x Item 6)	14,000	6.6
8.	Total Btu's per lb of fuel (based on data available)	20,000	40,000,000,000
9.	Total Btu per mile used (Item 2 x Item 8)	560,000	982,000
10.	Work in Btu per mile (Item 1 x Item 9)	157,000	157,000
11.	Total Btu per fueling (Item 7 x Item 8)	28,000,000	264,000,000,000
12	Years between fuel changes (Item 11 ÷ (Item 9 x Item 5)	.00347 (once a day)	1.87
13.	Fuel cost new (basesd on Prof. Lyle Borst's paper at Atomic Industrial Forum Meeting, March 1954)	$.0142857 lb	$9,090.90 lb
14.	Credit for poisoned fuel (estimated 1/5 of cost of new fuel)	———	$1,818.18 lb
15.	Net cost fuel per lb.	$.0142857 lb	$7,272.72 lb
16.	Net cost fuel per fueling (Item 3 x Item 15)	———	$240,000
17.	Net cost fuel per year (Item 16 ÷ Item 12)	$57,000	$128,000
18.	Net cost fuel per mile (Item 17 ÷ Item 5)	$ .40	$ .89
19.	Per cent fuel cost (from Item 18)	100	222
20.	Fuel lb per hp per hr (Item 2 x 40 mph ÷ 3,000 hp)	.38	.000,000,326
21.	Fuel lb. per hp per hr atomic plane (**Life** February 7, 1955) (800 mph x 5 lb) ÷ (14,000 miles x 475,000 hp x .18 per cent efficiency)	———	.000,000,340

use atomic energy in place of conventional fuel (coal or oil), then the main factor we will have to consider from a general design standpoint is to replace the combustion chamber and fuel storage and handling equipment with an atomic reactor (furnace).

"The reactor may be a solid fuel type or it may be liquid fuel type. It also may use a direct air-cooled cycle or an indirect liquid-cooled cycle. One advantage in the direct air-cooled cycle reactor (Fig. 1), is its simplicity due to the few small number of working parts.

"If a solid type of fuel is used, there need not be any radioactive fluid present to spill or leak out in the case of an accident. Also the reactor with solid fuel is mechanically controlled, while a liquid type fuel reactor eventually may have inherent self-control incorporated in the design. The indirect liquid-cooled cycle type reactor may be used (Fig. 2). In this case, a liquid coolant is passed through the reactor, which absorbs the reaction heat. This hot radioactive liquid is then pumped through a heat exchanger where air, or other gas, will take up this heat and carry it to the power turbine. This essentially eliminates potential danger from the use of air direct from reactor to atmosphere.

"The direct air-cooled cycle reactor would take air from the atmosphere, compress it and pass it through this reactor where it would absorb heat up to about 1,300 deg F, as in the case of the gas turbine locomotives in service on the Union Pacific, and then through the power turbine where this heat would be converted into power, then the air would be discharged into the atmosphere. This exhaust air may be highly contaminated and, if so, would be a potential danger to living bodies which come close to the point of discharge. As the exhaust gases mix with large quantities of outside air, the dilution will assist in reducing such danger.

"A very careful study would be required to go into all the reactor details but from this it can be seen that each type has about as many advantages or disadvantages as the other.

"Our problem now is to see how such an atomic reactor can be fitted into a locomotive.

"In selecting the size and weight for an atomic locomotive, we should start with one that can be used in freight and passenger road service, and in switching service, on most of our standard American railroads, and also could be used by our military. It should be designed so it can be operated as a single unit or as multiple units from one control cab. The controls should be simple and maintenance cost reduced to a minimum. It should be designed so there is a little potential danger to personnel or property.

"General specifications of such a locomotive could be as follows:

Atomic reactor heat output, hp	15,000
Shielding weight estimate, lb	85,000
Gas turbine, into generator, hp	3,000
D-c electric generator, hp	3,000
Six traction motors, hp	500
Two three-axle trucks. Wheel diameter, in.	42
Total weight of locomotive, lb	384,000
Weight on drivers, lb	384,000
Tractive force continuous, lb	96,000
Length of locomotive, ft	68
Height of locomotive, ft	15
Width of locomotive, ft-in.	10-6
Train steam-heat exchanger, lb per hr	3,000

"A diesel locomotive uses about 2 gal of fuel per 1,500 hp per mile in road service. The overall efficiency of this diesel will be about 28 per cent, at full throttle, full load, and this efficiency drops only slightly as the throttle and load is reduced.

"A present day oil-fired gas turbine will have about 15-18 per cent overall efficiency at full throttle full load.

Table II

Data	Diesel	Atomic
1. Expected life, years	15	15
2. First cost @ 15-yr life	$ 20,000	$ 69,333
3. Maintenance per year (diesel 40¢ per mile)	$ 57,600	$115,200
4. Cost fuel per year (Item 17, Table I)	$ 57,600	$128,000
5. Cost fuel storage, handling and liability in addition to diesel (estimated)	———	$ 25,000
6. Train crews same as diesel	———	———
7. Extra cost supervision and training over diesel (estimated)	———	$ 10,000
8. Total cost per year per locomotive	$135,200	$347,233
9. Operating cost per mile	$ .94	$ 2.40
10. Per cent operating cost (per cent)	100	258

Note: Interest on above fixed charges not considered.

This efficiency falls very rapidly as the throttle and load is reduced due to the characteristics of the turbine design, and also due to the large compressed air requirement of the gas fired turbine in order to control the temperature.

"There is no efficiency data available on an atomic energy gas-turbine, so all I can do is use my own judgment in order to arrive at some figure.

The turbine	20 per cent efficiency
The electrical transmission	80 per cent efficiency
Total efficiency	16 per cent

"I feel that all these efficiencies are realistic.

"From these figures, we can list the following data in an effort to compare an atomic powered gas turbine-electric locomotive with a modern diesel electric locomotive. (See Table I.)

"We should now weigh the good and bad points of each of these two types of locomotives, and where possible, relate these comparisons in terms of money—namely, dollars.

"Fuel is our first item to consider. The purchase price of fuel on a large fully dieselized railroad operating about 1,000 diesel units of 1,500 hp each will run about 160,000,000 gal at 10¢ per gal, or $16,000,000 per year.

"It would take 500 atomic units of 3,000 hp each, to "atomize" this railroad.

"The development cost of the first atomic locomotive would probably be at least $20,000,000. The cost per 3,000-hp unit, after mass production manufacturing is started would probably be about $1,000,000 each for the first 500 locomotives. If the development cost is absorbed by the first 500 units, then they would cost $1,040,000 each, as against a two-diesel unit costing about $300,000. The expected life would be about 15 years for each type. Therefore, an atomic unit would cost $1,040,000 ÷ 15, or $69,333 per year, and two diesel units would cost $300,000 ÷ 15, or $20,000 per year.

"The maintenance cost for a 3,000-hp diesel locomotive is about $.40 per mile, or 144,000 × $.40 = $57,600 per year. In light of the fact that many parts of an atomic locomotive will be radioactive (hot), causing it to be unsafe for mechanics to make repairs on the locomotive, the assemblies will have to be removed and set aside to cool off which may take months or years before repairs can be made. In some cases, the parts may have to be "dumped," which would result in a complete loss. A conservative estimated figure for maintenance cost per mile will be twice that of a diesel, or $.80 per mile, or $115,200 per year per 3,000-hp unit.

"The fuel estimate is taken from Table I. The storage and handling of used atomic fuel is very difficult and requires specialized equipment and personnel, but the quantity of the fuel and the frequency of refueling will be much less than for diesel fuel. The cost of fuel handling should balance each other. However, I am combining this possible additional cost with that of the liability insurance and other costs.

"The cost of the train crews should be the same for both types of power.

"These are some of the main costs and are enough for our present needs as shown in Table II.

"We now come to the subject to which no one living knows the answer, so I feel that I can speak freely. Safety-liability.

"This can be broken down into two phases. One phase is the normal danger that personnel are subjected to the radio-activity of the atomic fuel. I believe this phase can be handled satisfactorily with the present know-how and the careful training of railroad men. This, of course, will cost a great deal more than it does to train and supervise diesel maintainers, say, $10,000.00 per year per atomic locomotive.

"The other phase is what will be the consequence when something goes wrong with the equipment as a result of the failure of mechanical parts or personnel failure. I want to make it clear that I do not believe there is much danger from a controlled chain reaction, resulting in an atomic explosion; in fact, I am going to disregard this possibility. What I am talking about is a result of the failure of some safety equipment which would stop the control rods from operating. The reactor in this case could get so hot that it might melt down and run out on the ground. Of course, if this happened, the ground would become so radioactive that personnel could not come near it. The track would have to be abandoned for a long period of time, or the ground dug up and carried away by the use of very special equipment."

Mr Gunnell then proceeded to paint a vivid word picture of a collision between two atomic locomotives on the "Uranium Valley Railroad" caused by a highway truck in a densely populated area during a time when all airplanes were grounded by bad weather. In his story, which he says is pure fiction, but a possibility, the reactors get so hot that they melt and run into the street. The result is that an area of several hundred feet radius has to be closed off to be cleaned up later by means of a very expensive process.

He concludes by saying, "I do not believe that an atomic powered locomotive can be justified for use on our American railroad system for serving the public at the present time, or any time in the next 10 years, but there is one place I feel that an atomic locomotive would prove very valuable at the present time and that is in military service. A 3,000-hp unit may be a little large, but this can probably be reduced without too much difficulty. Think what a wonderful advantage it would be to have a military locomotive operating in some remote field, that only required refueling every six months.

"I recommend the military service as the first and most likely place for such a unit to be used, and it certainly does have great possibilities in this field."

SP Has Converted Six Cars To Dome-Lounge Type

Car length increased to 85 ft; steel frames strengthened. Special jig used to assemble dome roof structure

Six Southern Pacific dome-lounge cars, Nos. 3601 to 3606, inc., have been converted from existing lightweight cars at the company shops, Sacramento, Cal. They are all of the same design except that the elevated section of the first four cars consists of both a lounge and coach section and these cars run with the bar-end trailing; the elevated section of the last two cars are entirely lounge and these two cars operate with the bar-end leading.

Interior Arrangement

The cars, designed for through service, have no vestibules and are equipped with automatic sliding end doors. Upon entrance at one end of each car, six steps give easy access to the elevated section. This section on the first four cars consists of a coach section with 16 double and 2 triple seats accommodating 38 passengers as well as a lounge section seating 20 passengers on 10 sofas. Both coach and lounge sections are under the glass dome.

The elevated section of the last two cars is entirely lounge, accommodating 54 passengers on 24 sofas. All lounge furniture and coach seats, supplied by Heywood-Wakefield, conform to railroad company specification and design.

Storage lockers are located beneath the elevated floor at each side of the stairwell leading down to the lower lounge. An access door to the space beneath the elevated floor is installed in the stairwell at the opposite end of the car.

A partition, the upper portion of which consists of safety plate glass, divides the elevated lounge from the lower lounge, the latter also being under the glass dome. Large tinted glass windows with shades are provided at normal height. The lower lounge is equipped with two 4-seat table sections, two large sofas and four cocktail stands.

Decorative Treatment

The lower-lounge side of the partition between the upper and lower lounge is of decorative design consisting of special natural foliage plastic panels, framed in Philippine rattan with plate glass above. The bar front as the opposite end of the lower lounge is paneled with Parkwood and rattan.

The bar enclosure, with service opening to the lower lounge, contains stainless steel bar fixtures below the service opening with lockers and radio equipment above; a back bar consists of a large carbofreeze refrigerator and low cabinets with glass cabinet above. Separate hand washing facilities for the convenience of the car attendant are installed at the back bar. The cabinets and refrigerator are finished in Parkwood and the glass cabinet doors are of natural foliage plastic. There are low loading doors in the bar and in the passageway adjacent to the bar entrance.

A passageway leads from the lower lounge along the side of the car and storage lockers to the entranceway. The entranceway is bordered on one side by the electric locker and on the other side by a combination locker for both automatic door equipment and storage.

Decorative treatment of lower lounge which is also under the glass dome

Interior decorations were designed by Maurice Sands, a local interior decorator. The color scheme is green throughout. Interior walls are moss or grey green, the coach seats are upholstered in dark or jade green and the lounge furniture is upholstered in light green paneled with Parkwood and rattan of dark teak finish. Green carpeting covers the entire floor area except the entrance and passageway and the bar end which is covered with tan and brown marbleized rubber tile. Green carpeting also appears on the sides of the stair wells to the elevated section and on the side of the depressed center aisle in this section.

Basic Structural Changes

Existing cars were stripped of all furnishings, equipment, sheathing, floor, roof and trucks. The basic structures were spliced between bolsters to increase their length to 85 ft over coupler pulling faces. On car No. 3606, converted from T&NO car No. 950, the round end was removed and a new extension complete with dummy end applied.

The underframes and side frames were altered and reinforced as required, using high tensile steel. Sides were covered with high tensile steel sheathing and the girder and letter board area covered with stainless steel corrugated sheathing.

Structural crossties were applied at both partitions forming the lower lounge.

A new floor was applied 4 ft 7¼ in. above the normal floor height, extending for a distance of 46 ft 7 in. inside one end of the car to provide an elevated seating area.

This elevated floor has a depressed center aisle 13 in. deep to give overhead clearance below the main air duct.

The dome roof structure, 73 ft 4⅜ in. in length and installed over the elevated and lower sections, was purchased from the Budd Company in a partially disassembled form.

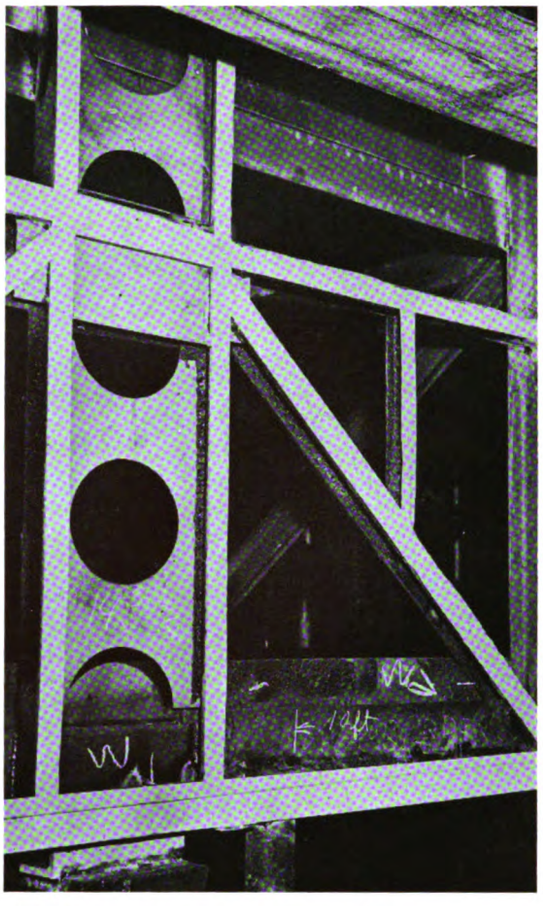
All parts were shipped to Sacramento where they were applied to the car and assembled as a complete roof structure, using the jig illustrated, which greatly simplified this operation.

The windshield frame at either end of the roof is molded of reinforced fibre glass plastic, also supplied by Budd.

The dome sash and windshield sash, as well as the conventional sash in the lower lounge and passageway, were made by Adams & Westlake. All sash is double glazed with Solex tinted and tempered plate glass on the outside and laminated non-tempered glass on the inside. There are 48 dome sash in all, 24 per side, 67⅞ in. long and 30 in. high.

Each windshield consists of one center sash and two wing sash. The inner windshield sash forms the inside face of the conditioned air passage and is hinged to allow access for cleaning the inside of the center windshield sash. To assure satisfactory service without glass breakage, all sash were applied, especially in the dome, with uniform pressure by means of electric impact wrenches

New body bolster and center sill end, made of welded high-tensile steel



Side frame construction and elevated floor supports

with adjustable clutch set to a predetermined, maximum torque.

The cars are equipped with rubber-cushioned draft gears and tightlock couplers.

Truck Features

Trucks are General Steel Castings four-wheel, lightweight design, having single drop I-beam equalizers, 36-in. wheels, 6-in. by 11-in. Timken roller bearings, helical coil equalizer and bolster springs, cushioned bolster friction snubbers. Cars SP-3602 to 3606, inclusive, are equipped with derailment safety guides with safety clips. Other truck equipment includes outside swing hangers, 24-in. central bearing, Budd disc brakes and Decelostat equipment for wheel slip protection.

Truck noises and vibration are dampened by Fabreeka pads applied to top and bottom of bolster and equalizer springs, between equalizer feet and pads on journal boxes and between swing hanger beating and apring plank.

Brake equipment is Westinghouse HSC type, arranged for 100 psi cylinder pressure operating through truck-mounted Budd design disc brakes. Cars SP-3601 to 3604 are equipped with electro-pneumatic straight air control while cars SP-3605 and 3606 have this feature omitted. The air brake equipment is designed to give a braking power equal to 250 per cent of the lightweight of the cars on rail and a deceleration rate of 3 miles per hour per second.

All cars are equipped with two independent air-conditioning systems, including two Waukesha ice engines with long-cycle control, two full-flooded evaporative condensers and 8 propane fuel tanks which are located underneath the cars.

One cooling unit is located over the bar beneath the normal roof contour to supply conditioned air to the bar, lower lounge, and a portion of the elevated section. The other cooling unit is located at the opposite end below the elevated floor supplying air through ductwork at the end of the car into the overhead air duct for the balance of the car. Both units supply air to the same overhead air duct.

The overhead air duct is equipped with Pyle-National Multivent panels for air distribution downward and Barber-Coleman grilles for horizontal air distribution.

Recirculated air for the bar end is returned to the cooling unit through grilles located in the ceiling just inside the end door entrance way and in the hallway. Recirculated air from the elevated portion of the cars is returned to the cooling unit below the elevated floor through outlets in the elevated floor located beneath the seats which are connected to duct work leading to the cooling unit.

Fresh air is drawn from the outside through Farr filters before being circulated through the cars.

Heating coils, adjacent to the cooling coils of the two cooling units, furnish overhead heat through the same air ducts. Vapor unit-fin radiation is used for floor heat throughout the cars and thermostats at each end of the cars control both floor heat and overhead heat. One Vapor

Tightening dome sash to a predetermined, limited and uniform pressure

automatic control panel with two sets of controls keeps the car at desired temperature under all conditions.

Each car is equipped with a 15-kw, 32-volt d-c axle generator with Spicer drive, a Waukesha 7½-kw 32-volt d-c propane-driven engine-generator and an Edison 25-cell A16H storage battery complete with rollout cradle. The generators are interconnected so that the axle generator will supply electric power when the car is in motion and the engine generator will supply power when the car is standing still.

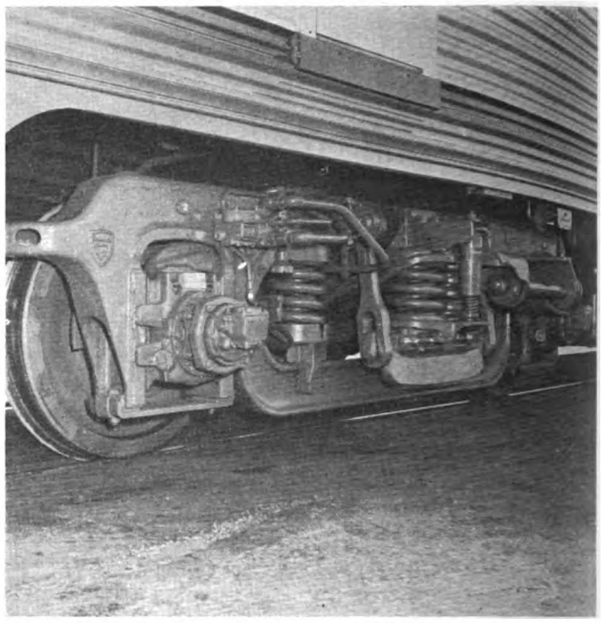
There are two propane cylinders for the engine generator which are for air-conditioning equipment or a total of 10 cylinders per car.

A radio is installed to supply AM broadcasts. Public address announcements and radio programs can be trainlined for adjacent cars as required. Both upper and lower lounges have annunciators.

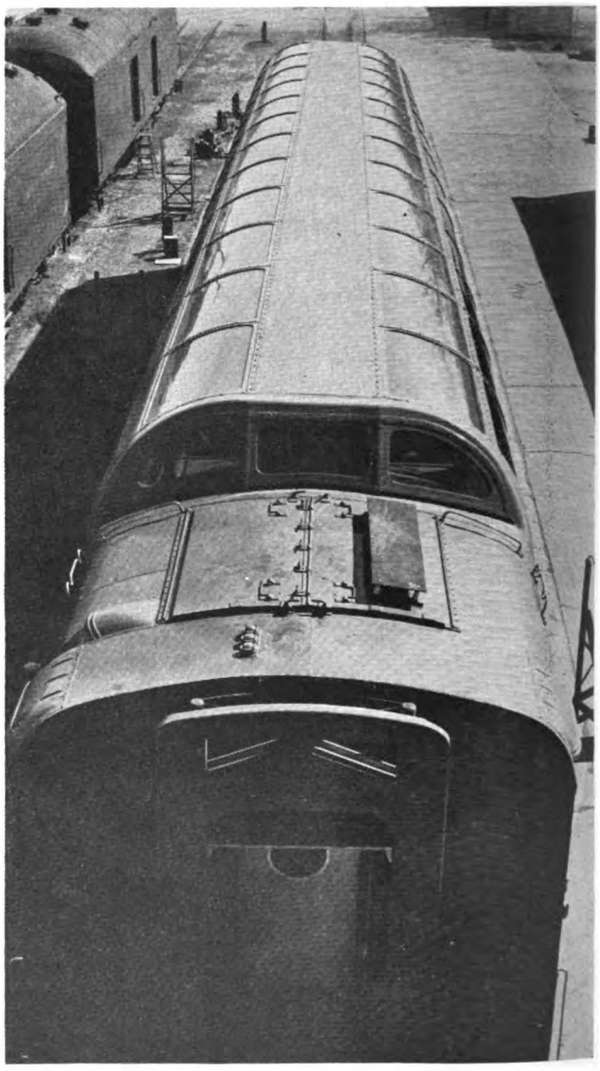
Cars are equipped with incandescent lighting. Twelve flush fixtures mounted in the underside of the overhead air duct are controlled by 3-way switches located in the hallway and opposite end stairway which permit use of half or all of the fixtures as desired.

Aisle-type lighting fixtures are used throughout to illuminate the floors, 13 of which are located in the aisle of the elevated section, 8 at the end stairway, 6 at the middle stairway and 12 in the lower lounge.

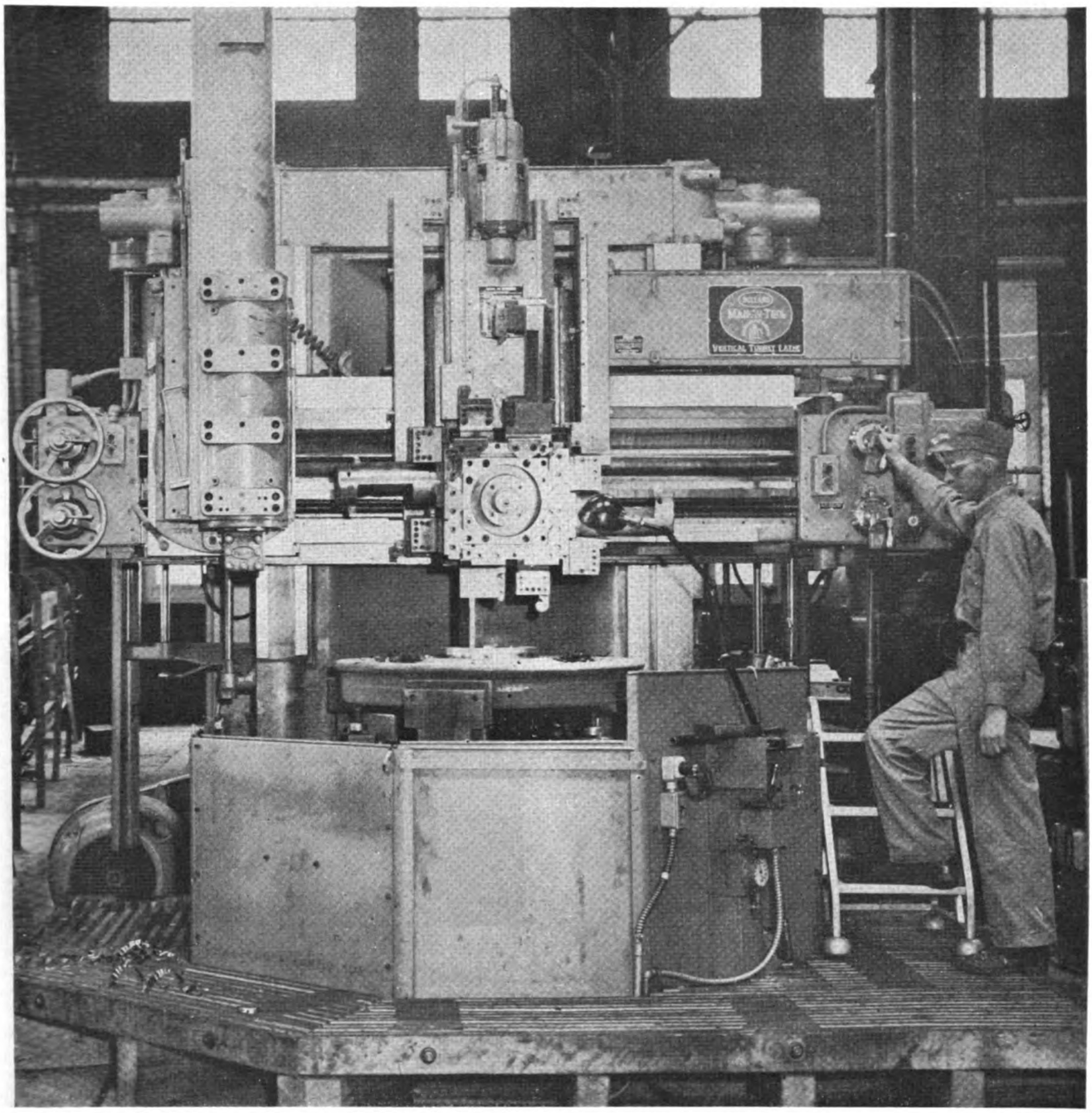
Reading lights with individual control are installed on the side walls of the lower lounge. The plastic foliage panels on either side of the stairway in the lower lounge are illuminated. Special illumination is provided in the bar.



General Steel Castings 4-wheel truck especially designed for quiet, easy riding



The SP dome-lounge-car roof construction includes a hatch in one end of the car



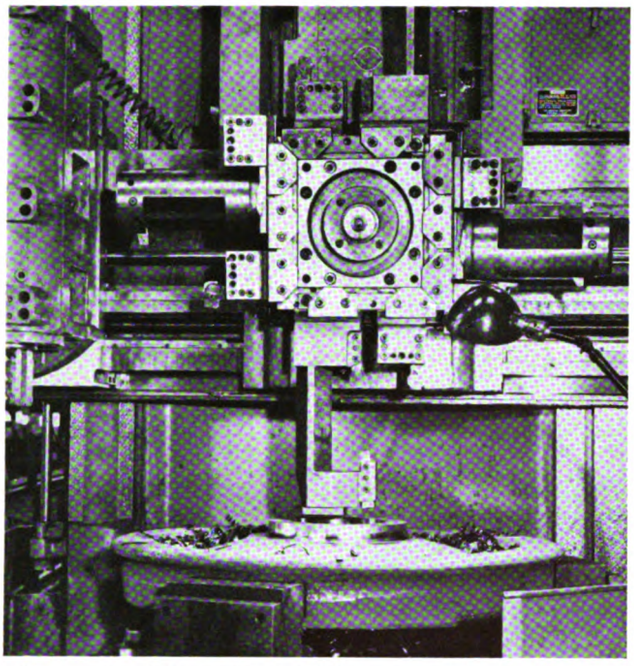
Bullard 54-in. Man-Au-Trol installed for machining diesel wheels at NP shop, Brainerd, Minn.—Wheel delivery chute

Diesel Wheels Machined Automatically

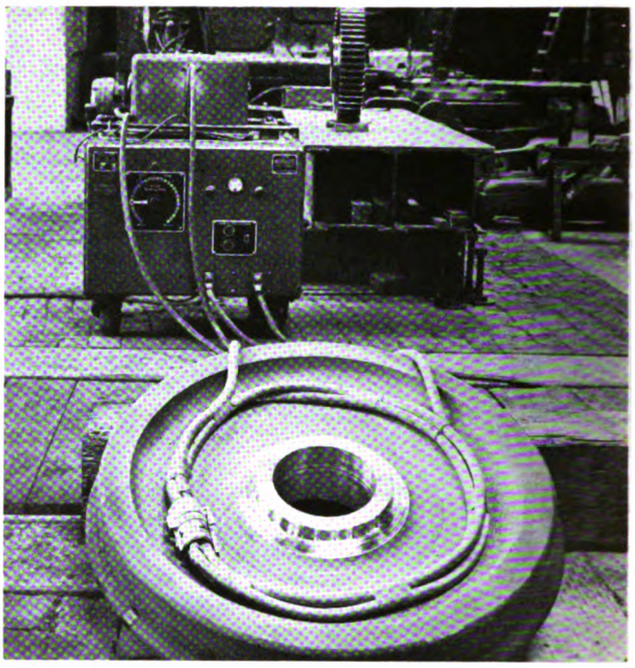
One new automatic machine not only does twice as much work as three older machines, but finishes wheel hubs to 0.001-in. accuracy

The Northern Pacific has installed at its Brainerd, Minn., locomotive shop a Bullard 54-in. Man-Au-Trol for automatically boring and machining 40-in. diesel wheel hubs at a single setting, with an accuracy of .001 in. and a production of six wheels in one 8-hr shift. This compares with a former production of three wheels a day, using three old-type boring mills.

New diesel wheels for both road and switching power are delivered to the shop where they are picked up with a crane and loaded on a flat car for movement to the



Close-up of tools for turning both hubs at one wheel setting.

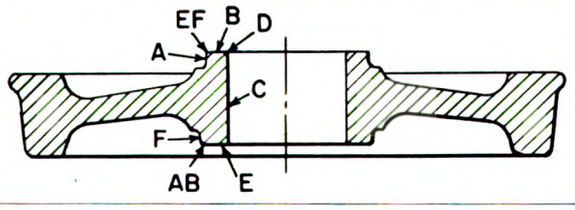


Equipment used in Magnaflux testing diesel locomotive wheels.

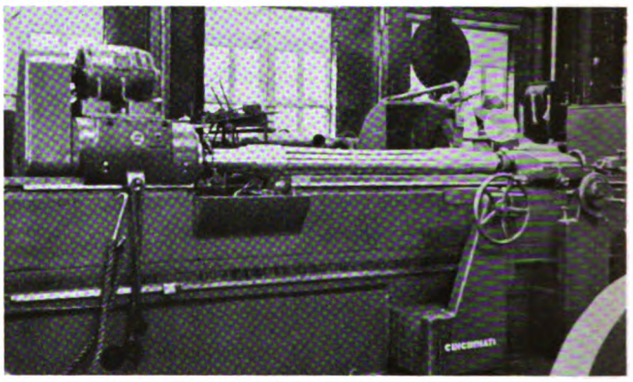
sand house where they are sandblasted on both sides. They are returned to the shop and loaded on an inclined chute, down which they roll at the left of the Man-Au-Trol. A tip-out device permits hooking a single wheel to the jibcrane and moving it to the machine table Here, it is automatically centered in a large three-jaw hydraulic chuck of special design, and three screw supports applied under the wheel rim (between chuck jaws) for added rigidity and accuracy. After machining, the wheels are Magnafluxed.

This Man-Au-Trol is a Bullard heavy-duty vertical turret lathe with either manual or automatic control for repetitive metal cutting operations. In machining 40-in. diesel wheels, all four index positions of the turret head are used and 39 different functions are available in proper sequences. After accurately setting all tools for the first wheel, no further adjustment of cutting tools is required until they have to be sharpened or renewed on account of breakage which occasionally happens in spite of the greatest care.

Referring to the wheel cross-section, the various car-



bide-tipped tools are brought into position and cuts made as follows: Rough bore *C* (1st cut) with .0156 in. feed down and 41.5 rpm; with .0104 feed down, rough turn *F* at 41.5 rpm and finish turn at 50.4 rpm; with .0156 feed right, rough face *E* at 41.5 rpm and finish face at 50.4 rpm; with .0104 feed up, rough turn *A* (1st and 2nd cuts) at 41.5 rpm; with .0104 feet right and up, chamfer *AB*, rough and finish; with .0104 feed up, rough turn *A* (3rd cut) at 41.5 rpm and finish at 50.4 rpm; with .0208 feed down, rough bore *C* (2nd cut) at 50.4 rpm and

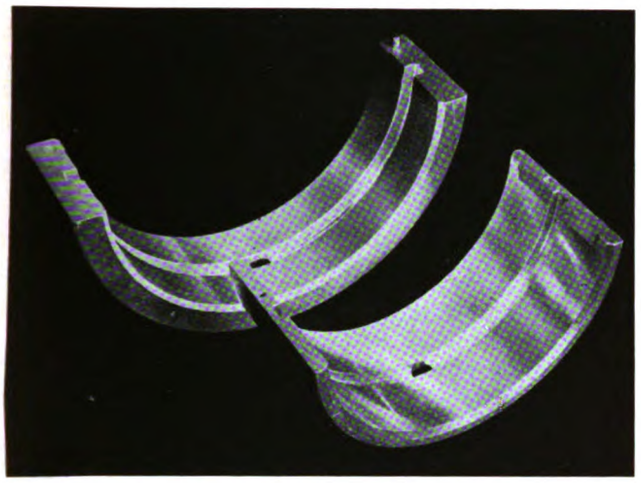


Finishing roller-bearing journal and dustguard seat on a modern Cincinnati 144-in. grinding machine at Brainerd shop.

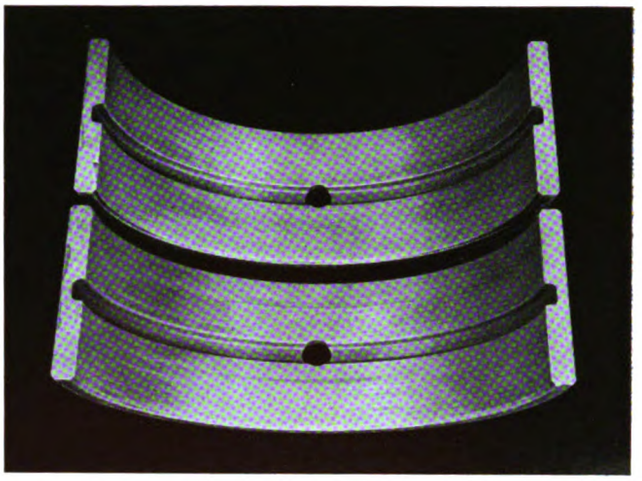
finish at 35.6 rpm; with .0156 feed down, rough turn *F* and chamfer *D* at 50.4 rpm and form radius *D* and break *EF* at 35.6 rpm; with .0156 feed right, rough and finish face *B* at 60.8 rpm.

After finish machining the upper and lower hubs, as well as the bore, wheels are carefully examined for defects or any minute cracks which may have been uncovered by cutting away surface metal. This operation is performed with a Magnaflux test machine, magnetizing coil and dry powder as shown in one of the illustrations. After checking the other side, the wheel is ready for mounting on an axle.

Both passenger car and diesel axles have roller-bearing journals and waterguard seats ground in the Cincinnati 144-in. grinding machine, the ¾-in. fillet between the two surfaces being formed by the rounded corner of the grinding wheel. In the case of power-driven diesel axles, the motor support bearings also are ground and the total time averages about 3½ hr per axle. The grinding time for non-power axles averages 2 hr and in this case the taper centers are finished between wheel seats with a pneumatic buffing wheel in an engine lathe.



Solid aluminum bearings as furnished to locomotive builder.



Solid aluminum bearings after a year's service in a locomotive engine

Engine Bearings of Aluminum

By D. B. WOOD

Head of Bearing Section
Cleveland Development Div.
Aluminum Co. of America

Solid aluminum alloy bearings made from castings furnished by the Aluminum Company of America have been in use for the past eight years in locomotive engines used by most of the railroads in this country. While such bearings are relatively new when compared with the history of bearings made of other materials, every indication from field service points to the fact that, with proper design and installation, they will take as much or more abuse as other bearings. Solid aluminum alloy bearings are unique in their field in that they are the only mono-metal bearings that can operate under heavy or high-duty requirements.

The basic advantages of solid aluminum bearings have been definitely proved in road service, substantiating previous assumptions founded upon laboratory test work.

In general the advantages of solid aluminum bearings can be listed as:

1. Resistance to damage of journal or adjacent parts in the event of failure.
2. Excellent resistance to corrosion.
3. Ability to carry heavy loads.
4. High thermal conductivity.
5. Conformability to misalignment.
6. Adaptability to various designs and types of applications.

In designing aluminum bearings, there are relatively few points for consideration. Running oil clearance and crush stress are probably the most important. In some measure, the crush stress influences oil clearance at operating temperature owing to such reduction in clearance as may result. Therefore, these two points will be considered together.

When aluminum bearings are used in ferrous housings and the ultimate operational temperature is high, careful and thoughtful analysis should be made of bearing crush requirements at installation temperature. Aluminum bearing alloys have a coefficient of thermal expansion approximately twice that of ferrous materials. This gives a differential expansion in the neighborhood of 0.0000065 in. per in. of length per degree F. Where aluminum bearings are used in aluminum housings, this differential expansion is eliminated.

By tests on actual connecting rods taken from large diesel engines and backed by experience in use, it appears that a crush stress of approximately 5,000 psi is desirable. This assures that the bearing is firmly seated in its housing and, depending upon the alloy selected, allows for reasonable temperature increase without the bearing becoming loose in the housing from permanent deformation as a result of high stress caused by elevated temperature.

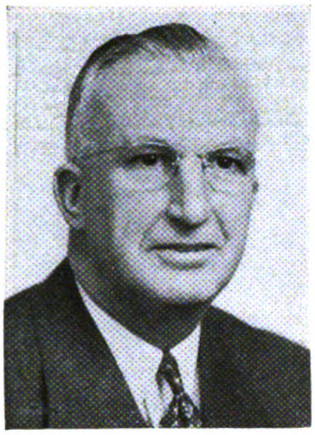
A recommendation is usually made to use an oil clearance of 0.0015 in. per in. of journal diameter where the bearing shell is concentric or uniform in wall thickness. When eccentric or taper wall bearings are used, an oil clearance of 0.00175 in. per in. of journal diameter is specified across the parting line of the bearing and 0.00125 in. per in. of journal diameter at right angles to the parting line surface at the bearing crown.

The above-mentioned figures refer to split-type bearings (usually two half shells) under reciprocating load conditions similar to normal engine bearings.

It is possible to reduce the figures given above for oil clearance by proper preparation of the journal or mating bearing surface and by adequate oil supply and filtration.

Many of the problems relating to crush and clearance can be reduced by the use of full floating bearings. Where design and installation do not present unsurmountable obstacles, solid aluminum lends itself naturally to this type of bearing because of its simplicity of fabrication.

(*Continued on page 49*)



Allied Railway Supply Association

D. F. Hall, president — C. F. Weil, secretary

RAILROAD MEN—NOTE!!

Because of the great numbers of visitors to Chicago in connection with the Machine Tool Show and other conventions, reservations for hotel space must be made as early as possible. Some who have asked for reservations have had their request returned. It is important that all railroad men requesting reservations for the Coordinated Meetings specifically mention The Coordinated Meetings or the Allied Supply Association Exhibit in making their requests. The reservations office of the Hotel Sherman will, in so far as it is able, find accommodations for railroad men attending these meetings if requests are made sufficiently early.

September's the Big Show

Coordinated Mechanical meetings, Allied exhibits, and Machine Tool Show to offer mechanical men rare opportunity in Chicago

The old saying that "All roads lead to . . . ." is certainly going to be true of Chicago, come this September. For there, on September 12, 13 and 14, after an absence of two years will be the three-day meetings of the Coordinated Mechanical Associations—Car Department Officers', Locomotive Maintenance Officers', Fuel and Travelling Engineers' and the Air Brake Association—at the Hotel Sherman. The Master Boiler Makers' we regret to say will, as a separate association, be missing this year, it having disbanded and joined forces with the Locomotive Maintenance Officers. This too is the year of the exhibit of the Allied Railway Supply Association and, on top of all this as an extra dividend to railroad men there is the "Biggest Show of All"—the Machine Tool Show of the National Machine Tool Builders Association together with the Production

National Machine Tool Builders' Association Machine Tool Show Committee. *Back row:* J. C. Herbert, Jones & Lamson Machine Co.; D. H. McIver, Ex-Cell-O Corp.; Frank Moran, Carlton Machine Tool Co.; S. A. Brandenburg, Monarch Machine Tool Co.; B. A. Gustafson, Sundstrand Machine Tool Co. *Front row:* W. E. Rutz, Giddings & Lewis Machine Tool Co.; M. A. Hollengreen, Landis Tool Co.; and F. U. Hayes, The Bullard Co. E. P. Cunninham, Clearing Machine Co. and Tell Berna, general manager, NMTBA, are missing in picture.

Engineering Show, these to be held simultaneously in Chicago from September 6 to 17 inclusive. This year any railroad mechanical man can well afford to plan for a few extra days in Chicago outside of the three days of the Coordinated meetings to avail himself of the opportunity to get a liberal education from the exhibits of 326 manufacturers at these two shows showing the latest in modern industrial machining equipment and devices which make possible the enormous output of our automotive and industrial plants. The Machine Tool Show will be held in the International Amphitheatre to which a new Exhibition Hall has been added to accommodate the show; the Production Engineering Show will be held on the Navy Pier. What will probably strike visitors to the Machine Tool Show as most impressive will be the amazing progress made in the last few years in the development of automatic operations and controls. There are said to be 441 distinct types of machine tools—not to mention various sizes and combinations. Practically all of these will be on display at the Show, and to make it more interesting, in operation.

The railroad equipment exhibit, at the Hotel Sherman, under the direction of D. F. Hall and C. F. Weil, president and secretary, respectively, of the Allied Railway Supply Association will, it is expected, be the largest one held in connection with these meetings. While, at this early date, it is not possible to say exactly how many companies will be exhibiting at Chicago there are, this year, many more exhibit booths available than has been the case with past exhibits because of expansion of the exhibit space at the Hotel Sherman. There are approximately 350 booths of various sizes available.

This year the Chicago meetings will be covered by daily editions of *Railway Age* and *Railway Locomotives and Cars* on Monday, Tuesday and Wednesday.

Advanced programs of such of the September meetings as are available at press time will be included in the August issue.

Engine Bearings of Aluminum

(Continued from page 47)

Probably the next most important design consideration is the method or device used in locking or fixing the bearing in its position in the housing. Over the years, various methods have been devised and used to accomplish this. When aluminum is being considered, it should be remembered that a device which provides maximum resistance to turning without restrictions that would result in high stress concentrations in certain areas or portions of the bearing is most appropriate.

The next item for design consideration is the finish of the journal or mating surface and the finish of the bearing itself.

The following general statements may best outline the optimum requirements.

... Bearing finishes obtained by cutting with a sharp tool are the best, even though the surface finish in measurable RMS (Root mean square, obtained by a Brush profilometer) is higher than for a surface obtained from a dull tool or one so designed that some degree of burnishing is done with the cutting operation. The above remarks apply also to journal finish or other surface of bearing.

... Final journal finishes should be obtained with a machining setup that does not allow irregularities to be present in the surface, or if this is impossible to control, then other measures should be adopted to insure an even surface plateau. It may be beneficial to superfinish and subsequently lap to obtain the results desired. The super-finish controls the plateau of the surface and thereby avoids sharp peaks; subsequent lapping leaves only voids in the surface, thereby probably increasing wettability, oil retention and reducing starting friction. Too low RMS (Root mean square, obtained by a Brush profilometer) finish may restrict wettability, oil retention and increase starting friction.

... Grinding on aluminum bearing alloys should be done with caution so that grit may not be left in the surface of the bearing.

... In some rare instances, it may be necessary to electro-plate the bearing surface. Depending upon the conditions of operation, such an overlay can be from 0.0005 in. to 0.020 in. in thickness.

... Once the design and fabrication of the bearings have been established, the next most important detail is the actual installation in the engine

... Cleanliness is certainly of utmost importance where engines are concerned. It may seem superfluous to mention things which are familiar to those who are so intimately connected with engines, yet too much emphasis cannot be placed upon engine cleanliness. Every engineer and shop foreman knows what good practice is—it is merely the desire and will to produce a superb machine.

... Bearings should be handled with care as dropping, nicking and hammering do not improve any bearing. When bearing caps are being torqued up, it is good practice to check the alignment of the two half shells at the parting line face to see that they do not overlap. A rough check on crush stress can be made at the time of installation. The easiest way of doing this is to bring the cap in position and draw up the bolt or stud nut tightly with the fingers only. A feeler gauge inserted between the cap and the housing will give a dimension from which crush stress can be calculated.

... A check should be made on oil clearance as well as total end clearance so that ample space is provided for increased bearing length at higher temperature.

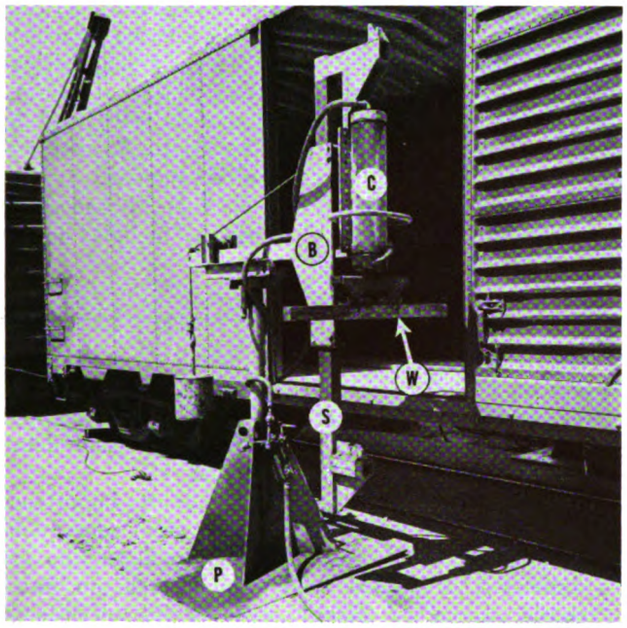
... The foregoing does not imply that solid aluminum bearings should be considered for heavy or high-duty applications only. In medium and light service, they work equally well and for new designs provide the opportunity to reduce physical dimensions

As an example of the foregoing, one of the foremost locomotive builders decided some time ago that solid aluminum bearings might be a forward step in its desire to furnish customers with the finest obtainable product.

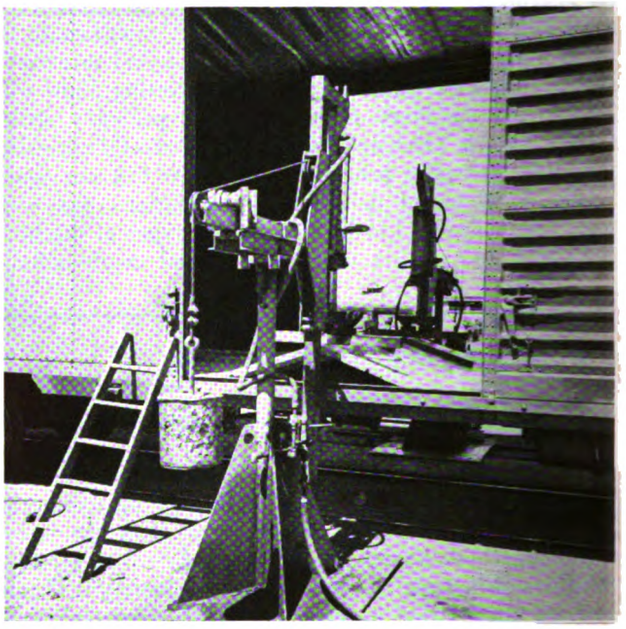
After a few years of proof testing in its own laboratories and in engines on the road, this manufacturer adopted solid aluminum bearings for production.

Considerable time and money as well as the ingenuity of its engineers and the understanding of its management were required to reach the degree of perfection finally achieved and now available as a standard part of their engine.

Ideas for the Car Repair Man...



Swung out of position to allow the box car production line to be moved, this air press quickly swings into the operating position once the door opening of the car is spotted and the decking has been placed throughout the length of the car.



Two of the air presses, one extending through each door opening, have lower jaws bearing against the underbody of the car and upper jaws holding wood members against the pyramid assembly which then applies necessary pressure to the car floor.

FREIGHT CAR DECKING PRESS.—The pneumatic decking press, illustrated, is giving exceptionally good results saving time and labor in the application of freight car floors at the Southern Pacific car shops, Sacramento, Cal. The flooring is applied easier, safer and tighter than by former methods which involved considerable manual labor and hand jacking.

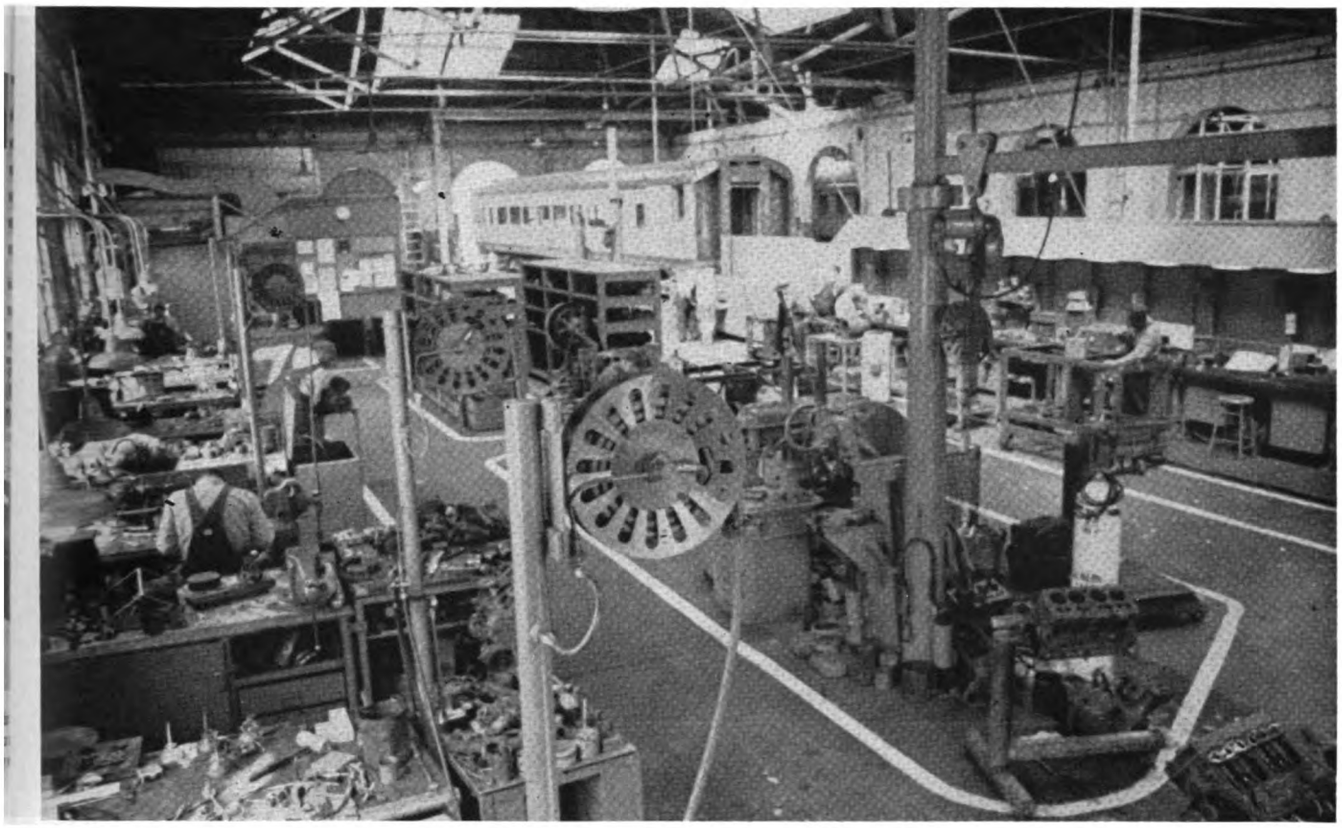
The decking press (one on each side of the car) is located at the floor-application position in the freight-car assembly line. It is mounted on a 4-ft. by 5-ft. by ¾-in. steel base plate *P* with four welded gussets supporting a 4-in. by 6-ft. central pipe which has a horizontal bar and vertical guide bracket *B*. A 6-in. by 32-in. outboard cylinder *C* with 26-in. stroke carries a 42-in. by 3-in. by 3-in. wood pressure member *W* attached to the piston end. Cylinder *C* is mounted on a welded steel construction having vertical movement by means of 4-in. square bar *S* in guide bracket *B* and a jaw at the lower end of *S* to contact the car underframe when swung into the operating position.

The horizontal member of bracket *B* and also the vertical bar *S* are 4-in. squares, made by welding two 4-in. angles together. The weight of the cylinder and its supporting steel framework is balanced as shown by means of a steel cable operating over pulleys and connected to a lead counterweight. The entire device swivels easily by hand on the vertical 4-in. central pipe and has a spring loaded pin stop to hold it in any desired position. Horizontal adjustment of the cylinder and supporting bracket *B* are also easily made by hand.

In operation, therefore, the car is loaded with the required amount of decking at the previous position and then moved to the position shown with doorways opposite the two decking presses. Decking is placed loosely in the car leaving out two boards at the center so that hand ratchet jacks can be used to take up slack. The open space is measured and two double-grooved boards selected having ½ to ¾-in. greater combined width, dependent upon moisture content of the boards and the amount of tightness desired in application.

Two pyramid floor formers are then made, each consisting of 5 boards nailed to 2-in. angle iron cleats 24-in. long. These pyramids are then applied at the center of the car floor. Each decking press is swung into position and pushed into the car door with the lower jaw directly under the car underframe and the wood pressure member *W* bearing on the apex of the pyramid. Application of air to the two cylinders brings the lower jaw up against the car underframe and continued application of the pressure forces the pyramid floor frames to a horizontal position ready for nailing.

The release of air pressure permits easily pulling the pneumatic presses out of the car doors and swinging them into the clear ready for the next car.



General view of the shop.

Overhaul of Undercar Power Plants

Southern Pacific has reduced maintenance of propane engine-driven generators and air conditioning compressors to the least common denominator

■ Overhaul of any railroad car or locomotive equipment usually consists of removing it from the vehicle to the shop, dismantling it, cleaning the parts, replacing or restoring parts to essentially new condition, reassembling the equipment and putting it back in service. Engine-driven generator and compressor sets have many parts, but when the work is well organized the maintenance procedure becomes relatively simple.

The Southern Pacific does this work in three shops, one at Los Angeles, Calif., one at Sacramento, and one at Bayshore. The illustrations shown here were all taken at the Sacramento shop. Most of the work in this shop is done in one corner of a building, in a space 41 ft wide by 110 ft long. An average of 22 units is overhauled per month. Ice engines or compressor units are overhauled about once in nine months and engine-generator sets at six-month intervals.

When an ice engine is to be overhauled, the refrigerant is removed from the system, and the unit moved from the car to the shop on a fork lift truck.

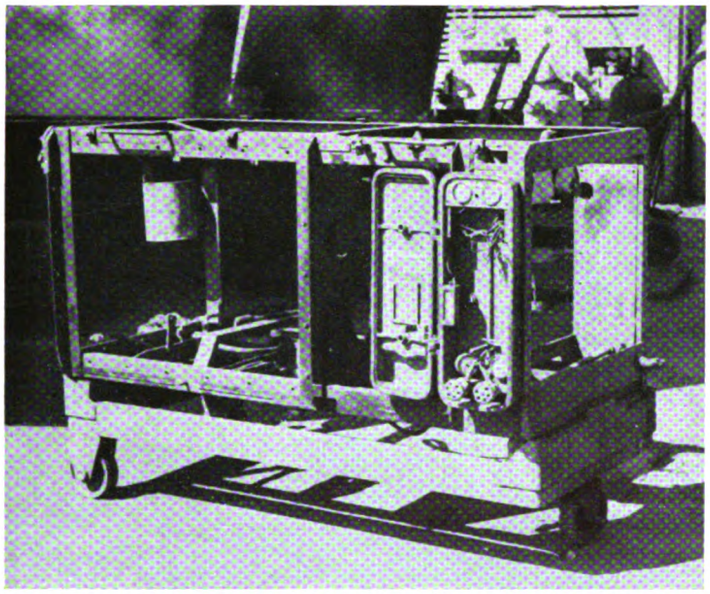
The engine is put on a dolly and remains on it through the process of overhaul. The engine radiator and ice-engine condenser are removed and steam cleaned.

Both ice-engine and engine-generator units are completely disassembled, and all iron and steel parts are cleaned in a hot detergent. Another type of hot solution is used for brass and aluminum parts. This includes radiators and condensers.

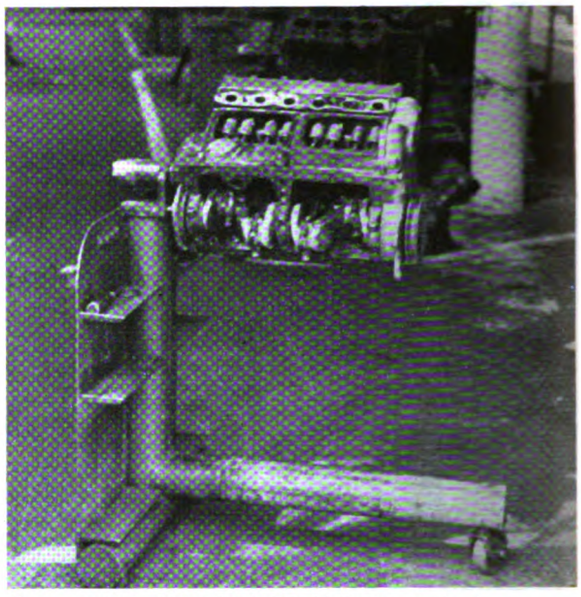
Engine Overhaul

After cleaning, cylinders are gaged and honed if necessary. If scored they are rebored and fitted with oversize pistons. Two oversize pistons are used, one 20, and the other 40 thousandths of an inch over standard.

New piston rings are applied and valves are ground. New valves and seats are applied if necessary. Valve



The frame of a set remains on a wheeled dolly as the work of overhaul proceeds through the shop.



Engines remain on a wheeled stand during overhaul.

guides are always renewed. The use of roto valves has increased the life of valves and seats and reduced the amount of grinding required.

Crankshafts are all hard chromium plated. This permits running a crankshaft through two overhaul periods. Cam shafts and cam shaft bearings require little maintenance and there is little need for new tappets. Connecting rod and piston pin bushings and main bearings are renewed on each overhaul.

Water pumps are provided with new seals and bushing. Oil pumps are tested and, if in need of repairs, they are supplied with necessary parts. They are tested on a stand to see if the pump will produce a pressure of 85 psi when running at normal speed.

Special instruments are used to measure distributor resistance, engine performance and fuel consumption. Air cleaners are cleaned, but otherwise need practically no maintenance.

Compressors

Compressors are given new thrust bearings if necessary. Crank shafts are hard-chromium plated. They are fitted with all new bearings. Cylinders are honed if necessary and pistons are fitted with new rings. Valves are disassembled and valve plates are ground and reassembled. New pins and bushings are seldom required.

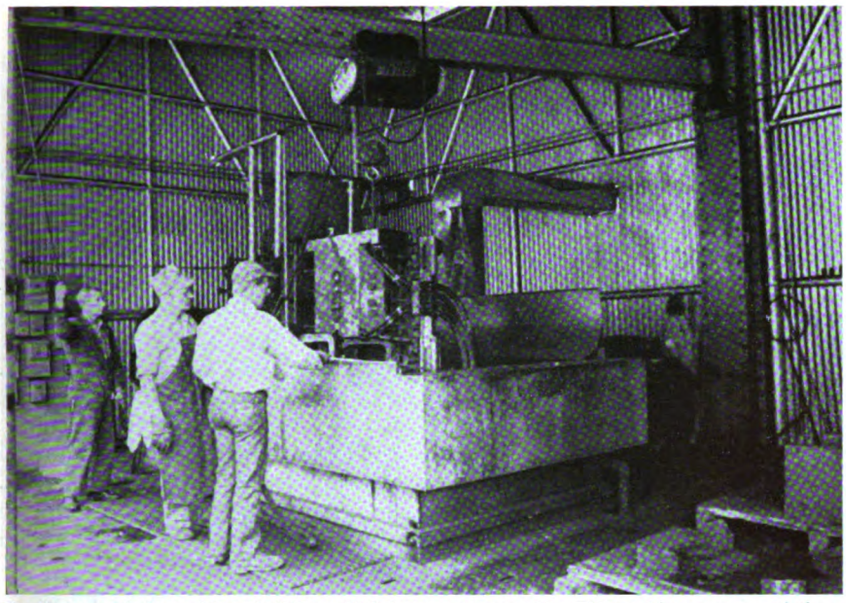
Crankshaft seals are ground to a mirror finish until they will adhere to each other.

Fan assemblies are disassembled and fan bearings are replaced when necessary. Outboard or compressor drives are disassembled, and the drive shaft fit is built up with acetylene welding and remachined. The spacers for seal bearings are replaced and ball bearings are removed if necessary. Air flow fans and idler pulleys receive new bearings if necessary.

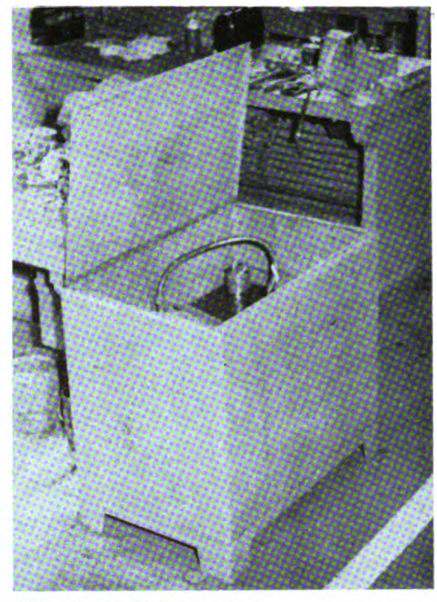
Bearings are tested by spinning and new (no reclaimed) bearings are used for replacements. Overhauled compressors are run on a stand for about four hours to seat the crank shaft seal, and then a vacuum of 26 to 27 in. is pulled on the compressor. The vacuum must hold for eight hours, and if it does not, the system is then charged with freon and the leak located with a leak detector.

Bench for overhauling and testing starters, vacuum switches, oil pressure switches, temperature switches and high- and low-pressure switches.

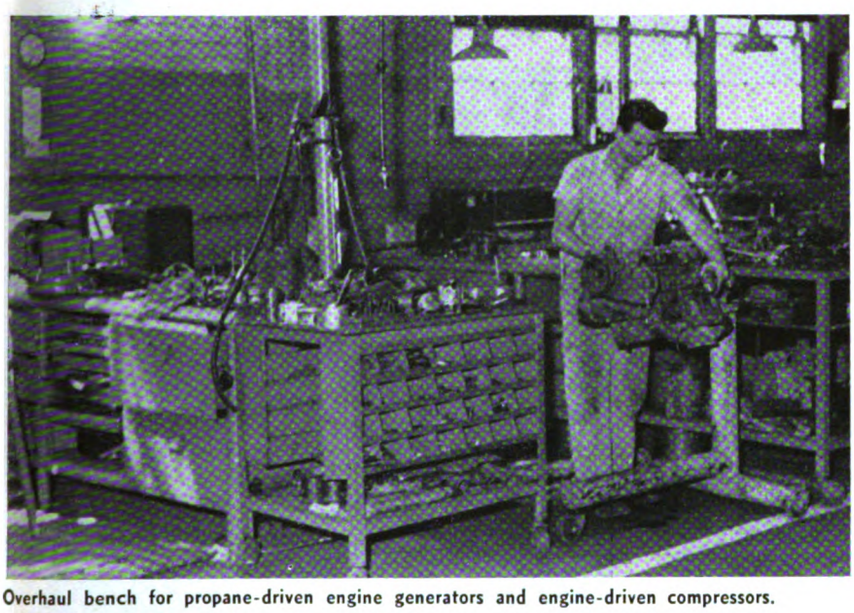
Panel overhaul and testing bench.



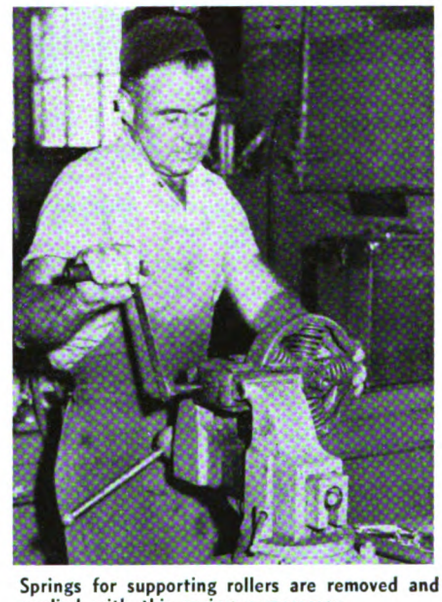
The degreaser is housed in a building which is open on one side. This avoids any accumulation of vapor and prevents strong drafts which might lift vapor from the tank.



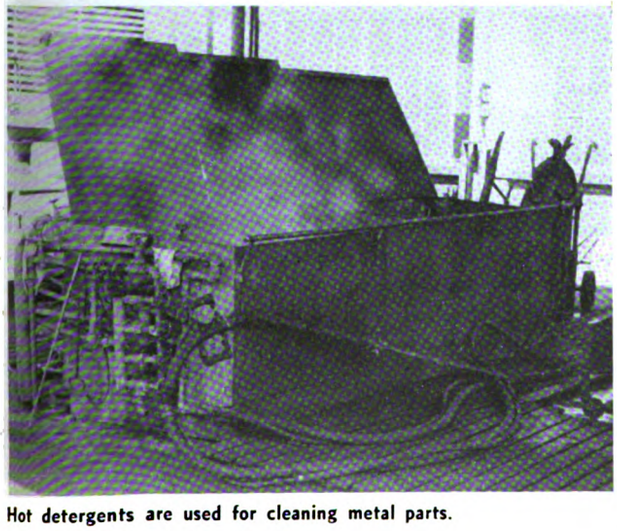
Cleaning tank for bearings.



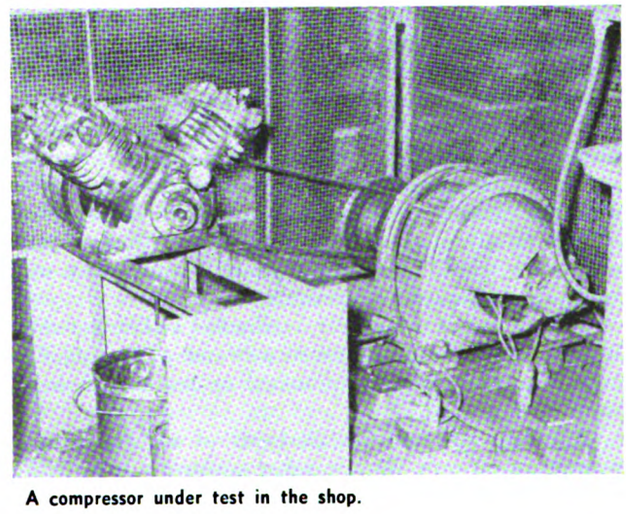
Overhaul bench for propane-driven engine generators and engine-driven compressors.



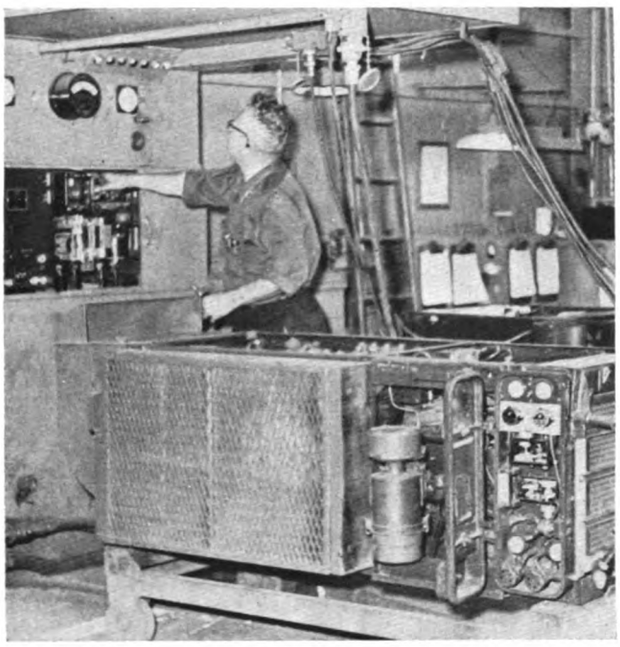
Springs for supporting rollers are removed and applied with this spring compressor.



Hot detergents are used for cleaning metal parts.



A compressor under test in the shop.



A completely reconditioned set is tested on one of the shop control panels.

The generators come off as a unit, and are dismantled and cleaned in a vapor degreaser with trichlorethylene. All wiring is checked and coils are replaced if necessary. All coils are reinsulated with brush-applied insulating paint.

Brush rigging is cleaned and adjusted and all new brushes are applied. The generator bearing and oil seal are usually replaced.

The engine-generator coupling is fitted with new pins and bushings. The bushings are bronze and the pins are steel.

Leads to the generator are replaced. Brush holder bushings and insulators sometimes need replacement. Starting resistors are taken apart and nickel-plated before being reassembled. Commutators are turned and undercut. The insulation resistance of the overhauled unit is measured with a 500-volt megohm insulation tester and must show a resistance of three megohms.

The ice engine starter and all wiring are removed. High- and low-pressure switches are removed and overhauled. Oil-pressure switches, vacuum switches and by-pass solenoids are checked and set. If damaged, they are replaced. Wiring is overhauled and new wire applied where needed. Selenium rectifiers are checked for output. Plugs and receptacles for ice engine to car connections are disassembled and the contacts checked.

Control panels are overhauled in a separate shop where all instruments are checked and reworked. Replacements consist mostly of starting switch contacts, and mercury control switches. The control panel is completely overhauled and checked for operation.

When a unit is completely overhauled and reassembled, it is run under load and tested with one of two standard control panels which are mounted on test boards in the shop.

The shop also handles all types of air conditioning equipment on cars, electric water coolers, axle generator drives and portable power plants.

Australian Electrification Starts Operation

■ The first stage of electrifying the main line railway between Sydney and Lithgow, in New South Wales, Australia, is now complete. In February, 1955, the first section, between Parramatta, in the suburbs of Sydney, and Blacktown, was opened to traffic as an electrified line. It is expected that the second section between Blacktown and Penrith will be electrified by September of next year, and the final stage to Lithgow by the middle of 1957. Altogether, 82 route miles, including 232 miles of track will be electrified.

A considerable amount of electrification was carried out in Sydney and its suburbs between 1926 and 1951. The present change-over from steam to electric traction has been necessitated by increasing freight traffic, which must be moved on grades up to 3 per cent.

The 1,500-volt d-c system is used and all motive power will be equipped for regeneration.

THREE ORE UNLOADERS AND A CONVEYOR SYSTEM ON THE CANTON RAILROAD ORE PIER AT BALTIMORE, MD. The Cottman Company unloader in the foreground was designed and built by Heyl and Patterson, Inc., Pittsburgh, Pa. The 1,136-ft long conveyor, running the length of the pier and the onshore weigh station, as well as the unloaders, were added last year to increase capacity. Since then, the new facilities have been able to unload two ships in the time it formerly took to unload one.

The unloaders are powered by General Electric motors and controls, and the long conveyor belt on the right side of the pier is driven at a speed of 545 ft per min by a G-E 250-hp wound rotor motor, operating at 870 rpm. It can carry 3,000 long tons of ore per hour.

Good illumination with freedom from platform obstacles is shown in this night picture.

Catenary System for Platform Lighting

By C. G. NELSON
Assistant Electrical Engineer
Great Northern Railway

■ The Great Northern has devised a lighting system for passenger platforms at its Havre, Mont., passenger station which provides well distributed illumination with very few supporting poles.

The old low-mounted lighting system has been replaced by a completely new incandescent lighting system employing 40 Line Material Spherolite luminaires which illuminate the full platform length of 1,500 feet required for the long passenger trains.

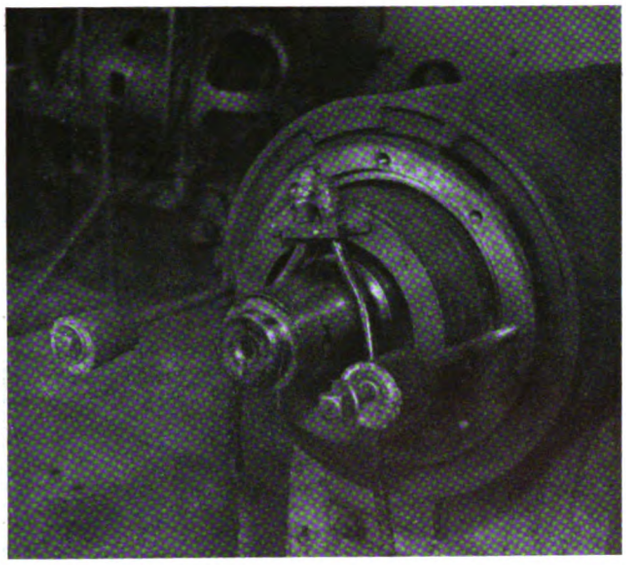
The platform between east-bound and west-bound tracks is 8 ft wide and the reduction of the usual number of supporting poles minimizes baggage and express handling obstacles. Poles are spaced 300 ft apart with 4 Spherolites in each of the 5 spans, suspended from a $\frac{7}{16}$ in. guy strand. Power supply wires are also suspended from the messenger. Fixture mounting height is 28 ft.

Calculations showed that the end poles would be deflected inward $2\frac{1}{2}$ in. under the anticipated 6,000 lb loading. Therefore, these poles were installed offset so that the loading would return them to vertical. In designing this inherent compensation into the system, the engineers improved the installation appearance and allowed for the extreme temperature variations at Havre. During the summer months, the poles remain virtually vertical, but during winter months, each end pole is deflected inward $1\frac{1}{2}$ inches due to guy strand contraction.

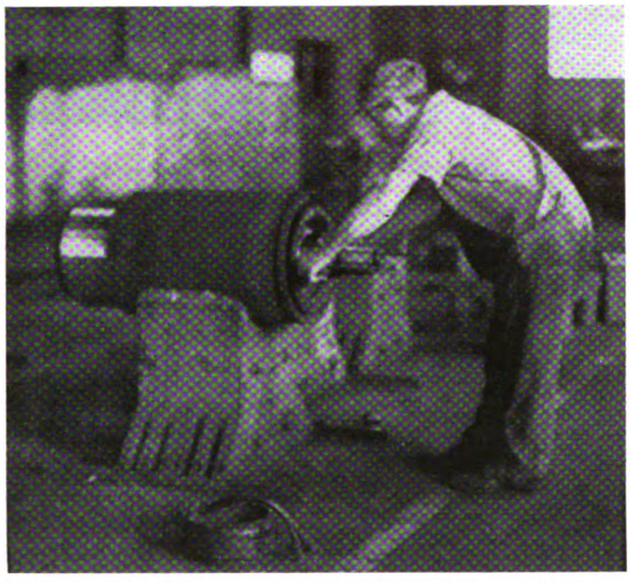
The 20 luminaires on the station-side platform, shown at the left in the illustrations, are aligned by using three different types of mountings. Six luminaires are supported by 4-ft brackets attached to steel poles, 4 are mounted on 15-ft brackets attached to the station building, and 10 luminaires are suspended from another catenary support. The design features of the two catenary supports are similar, except the station-side support has five Spherolites per span.

The catenary supports are used on the full length of 8-ft platform between tracks and along the far end of the station platform. Bracket type supports are used on the station building and along the end of the station platform shown in the foreground.

Equipped with 500-watt incandescent lamps, this 40-luminaire system provides an average lighting level of 1.98 footcandles on the two platforms. The four luminaires attached to the building provide Type II light distribution patterns, whereas all the others provide Type I patterns.



Heating coil and striking weights applied ready for removal of inner bearing race and flinger



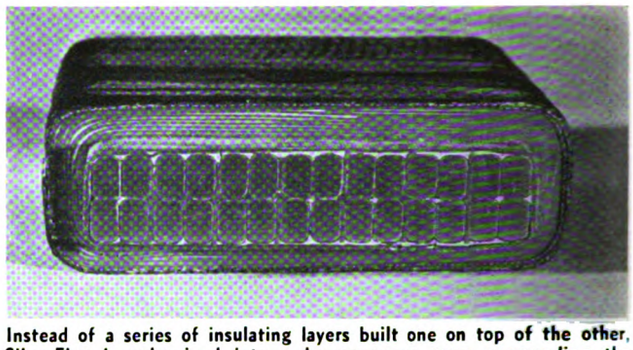
When the race and flinger have been heated, the coil is taken off and the operator uses the striking weights as shown

Easy-Off for Inner Races

■ A method of removing the inner races of pinion-end, traction-motor bearings, developed in the Marion, Ohio, shops of the Erie, makes the job a quick and easy one.

The armature is placed on a stand in a horizontal position, and a shop-made induction heating coil is placed over the inner race, after the bearing has been removed. Two 12-in. bolts are screwed into opposite holes of the inner bearing cap. On each of these bolts is a 2-lb conical weight which slides freely on the bolt.

Sixty-cycle current is applied to the coil which heats the race and flinger to a sufficient temperature in two minutes. The operator then pulls the weights toward himself, striking them against the heads of the two bolts. A few taps bring the race and flinger off the armature shaft.



Instead of a series of insulating layers built one on top of the other, Silco-Flex is vulcanized into a homogeneous mass surrounding the conductors

Motors Insulated By All-Silicone Rubber

■ A new all-silicone-rubber insulation system has been made possible by some recent improvements in the physical and electrical properties of Dow-Corning's Silastic in conjunction with new procedures developed by Allis-Chalmers. The result is a new motor insulating system termed Silco-Filex which is usable for all Class H insulated form wound coils and for Class A and B windings operating under certain service conditions. The following characteristics are expected:

HEAT RESISTANCE: The dielectric and mechanical properties of silicone rubber do not change significantly with aging at high temperature over long periods of time, even up to 250 deg. C (482 deg. F).

MOISTURE RESISTANCE: Water absorption is insignificant, with little or no effect on dielectric properties. Surface resistance remains high under moisture-condensing conditions that cause many insulations to flash over.

ABRASION RESISTANCE: Higher to abrasive dusts than most other insulations.

CHEMICAL INERTNESS: Withstands most atmospheric contaminants, corona and weathering, also weak acids, alkalies, and lubricating oils.

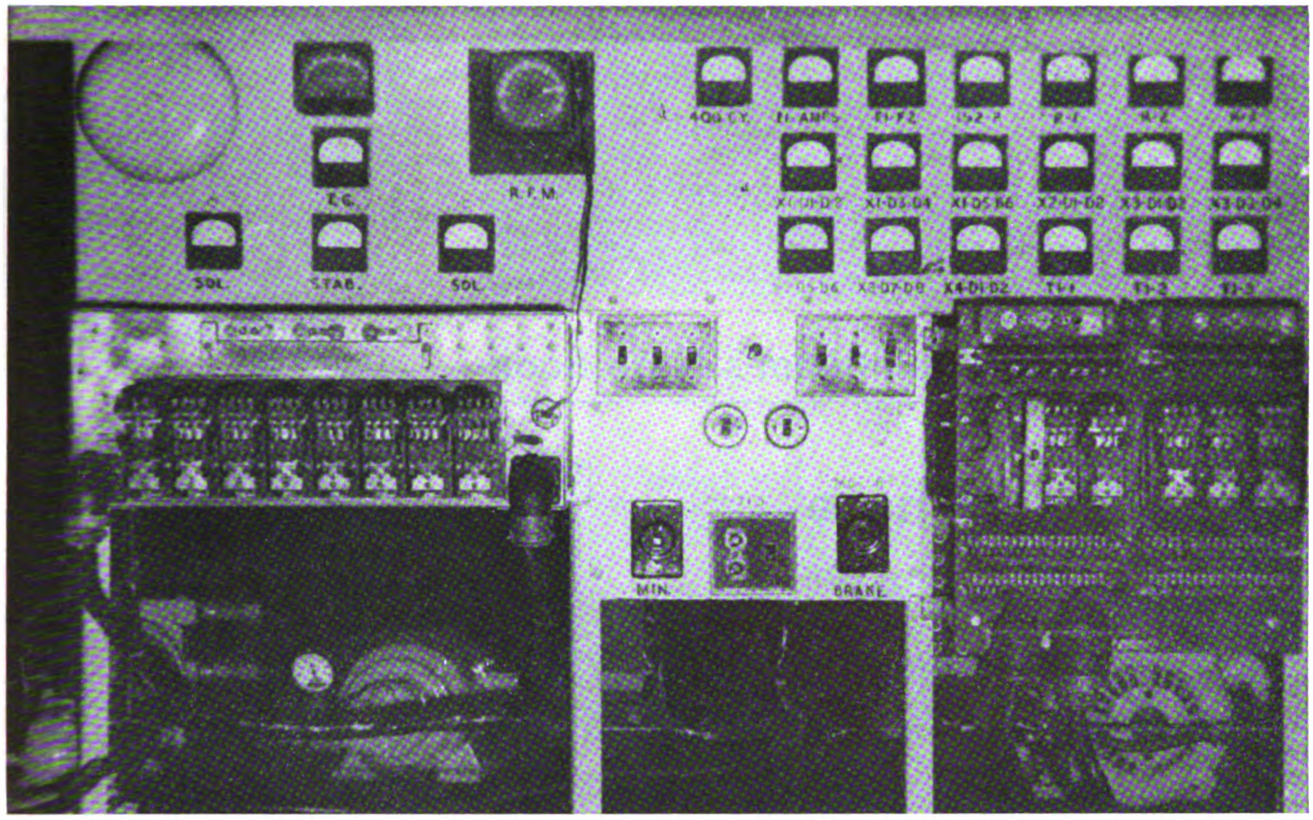
IMPROVED HEAT DISSIPATION: Cooler operating windings result from the high thermal conductivity of silicone rubber.

The first use of Silco-Flex was on insulated stator coils, in which the silicone rubber is applied to conductors, and vulcanized into a homogeneous mass by the application of controlled heat and pressure. The result is a sealed, dielectric barrier, continuous around the coil and leads, which forms a flexible, moisture and heat-resistant wall over the entire coil structure.

The application of this new insulation by Allis-Chalmers is currently being limited to motors of 1,000 hp and over operating at voltages from 2,300 up. As production is increased, its application will be extended to motors and generators of lesser voltage and horsepower.

The possibility of eventually using this all-silicone insulation on diesel traction motors or generators will depend partially on its greater electrical strength.

A second factor that might determine applicability for railroad usage is the feasibility of repairs. Small shops would not probably be equipped to make repairs, but it might be practical to handle such jobs in the larger shops. The repair is made by gouging out around any break and vulcanizing in a new section.



The meters with the control switches provide all the information needed to show that each part of the equipment is in perfect operating condition

Test Stand Measures Actual Values

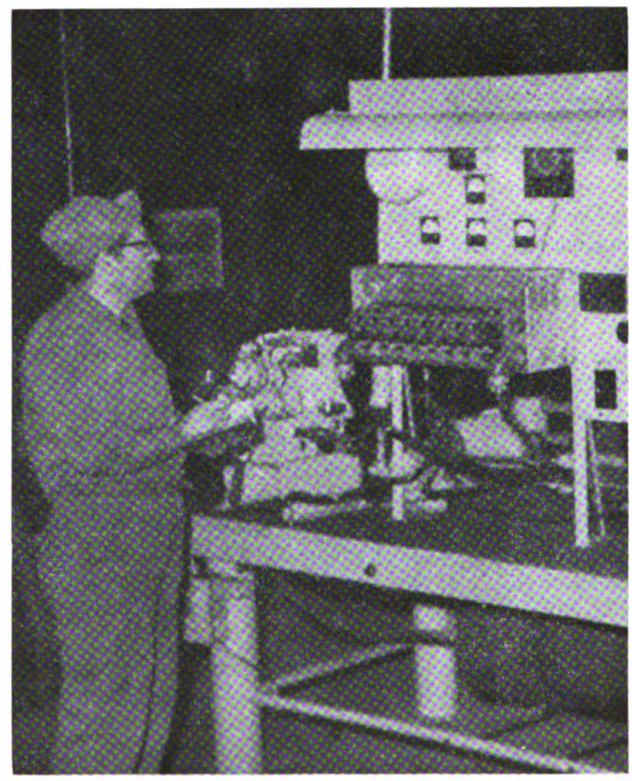
■ Rather than rely on comparison tests which must assume that one piece of equipment is in faultless condition, a test stand has been developed in the Baltimore and Ohio's Glenwood, Pa., shops which uses actual values of volts, amperes, rpm, etc., to determine the condition of a piece of equipment. The stand is used for testing No. 105 and No. 110 General Electric control panels, governors, tachometer generators and 400-cycle motor generators for types FA2 and FB2 Alco-GE locomotives.

The testing equipment includes a G.E. type 17FM105 B4 panel, a type 17 FM 110 D1 panel, a type 17 MG6 governor, a tachometer generator, a 400 cycle mg set, a type CP3007 air motor, the necessary meters and switches and wires to connect the listed equipment. This duplicates the control and excitation equipment on a locomotive.

Operating current is generated by a d-c motor generator set at 74 volts. Compressed air for operating an air motor is supplied through a valve which is controlled by the governor. The air motor simulates the speed of the locomotive. A multipoint switch, used as a throttle, energizes the various relays on the 110 panel and the speed of the air motor is controlled by the governor through the tachometer generator which is driven by the air motor.

The tachometer generator supplies current through the 110 panel to control the operation of the speed solenoid in the governor.

Separate excitation for the 105 panel saturable-core reactors is supplied by small dry-plate rectifiers and the



The test stand operator makes a complete record of voltages, currents, speed, etc.

same conditions are set up as found on a locomotive in operation. Known values of currents and voltages, found through trial and actual operation, are used to determine if the equipment on the panels is in proper adjustment and operating condition. These values are measured by a number of voltmeters, ammeters, milliameters and an electric tachometer. The voltage drop of each reactor is indicated by meters. Also measured are the voltages of rectifiers, amplidyne field and main generator field current, speed-solenoid, stabilizing c rent, tachometer generator output voltage, 400-cycle voltage, and voltage and current relations of reacto rectifiers and resistances.

Some required test currents and voltages were suppl by the manufacturers. Others were developed by act operations. The equipment makes it possible to test parts of the equipment before it is placed on locomotive.

From the Diesel Maintainer's Note Book

Only Place Where Trouble Could Be

By Gordon Taylor

■ A three-unit diesel locomotive composed of three GP-7 EMD units, popularly called jeeps, arrived at one of the smaller terminals with all units presumably working okay. The units were serviced with fuel and were made ready to dispatch in service.

It was then noticed, as the units were being coupled to the train, that something unusual was happening. Everything seemed normal with the control throttle in the IDLE position. However, as soon as the reverser was moved to either the FORWARD or REVERSE positions, the locomotive developed power and started moving with the throttle in the IDLE position.

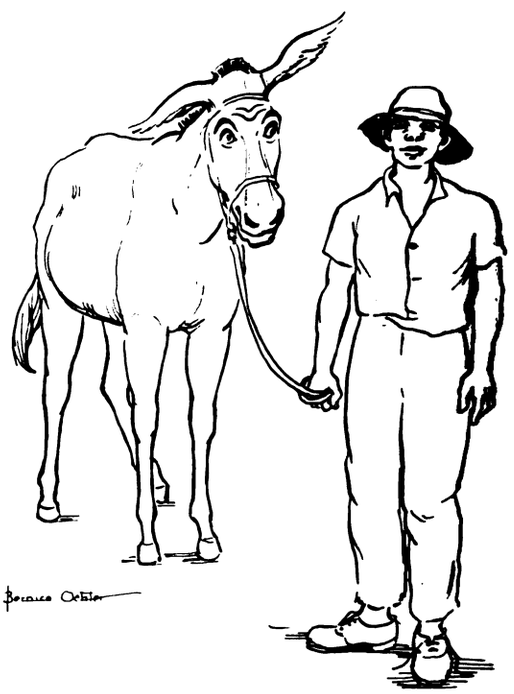
A quick inspection revealed that the middle GP-7 unit was the one at fault. It would become jumpy and start moving as soon as the reverser was moved either to Forward or Reverse directions. It was also noted that the battery field contactor was closing as soon as the isolation switch was closed to place the engine on line.

The problem for the maintainer was to find what was causing the battery field contactor to close ahead of time, causing the unit to become excited and energized. What appeared to be a simple case of trouble-shooting turned out to be rather difficult. The local electrician checked everything that he could think of that might have caused the trouble, but was unable to locate it.

The unit was moved to its home maintenance point for further attention. The diesel supervisor and maintainers then gave some thought as to what condition would cause the battery field contactor to close as soon as the isolation switch was closed.

There seemed to be but one answer. There must be a short circuit that was energizing the battery field so that the generator was excited, and ready to deliver power as soon as the series or power contactor was energized. If that theory was correct, then it would need only the closing of the reverser in either direction to cause the jeep to become jumpy.

The next question was where could be a good location for the suspected short circuit? The PC wire which constitutes the starting point in the control system seemed bound to be involved. Also, the generator field circuit was suspected.



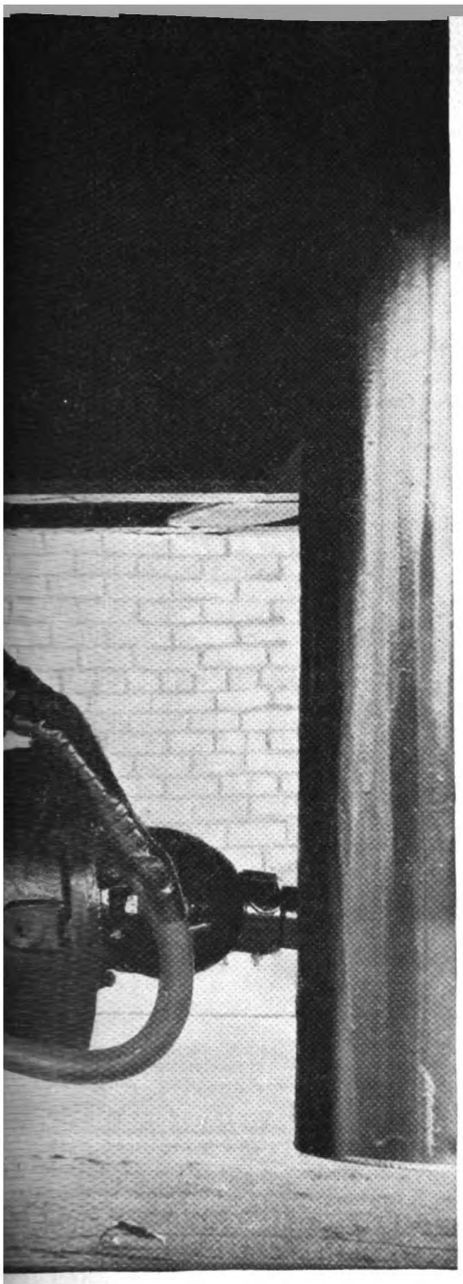
Ah just thought where Ah would go if Ah was a mule

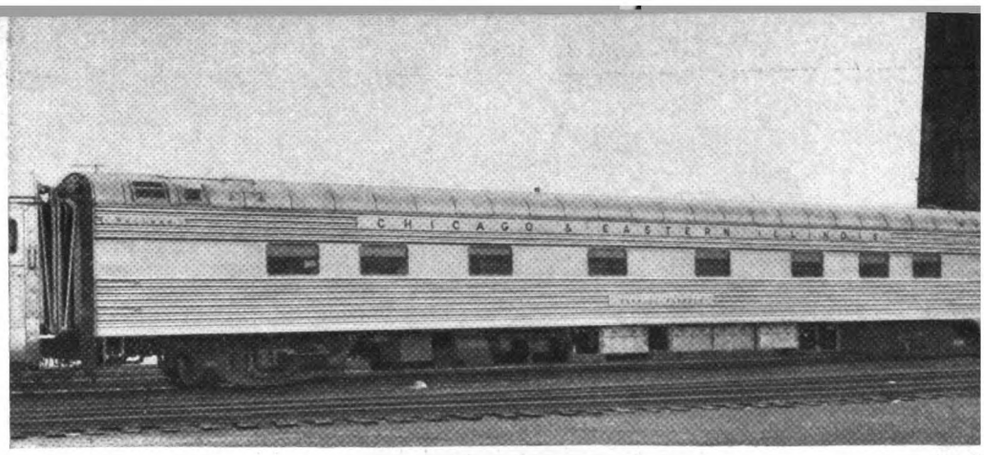
The next question was: where is a likely location for the PC wire and GF to get together? It was decided that the cable of wires back of the control stand might provide a good hunting ground.

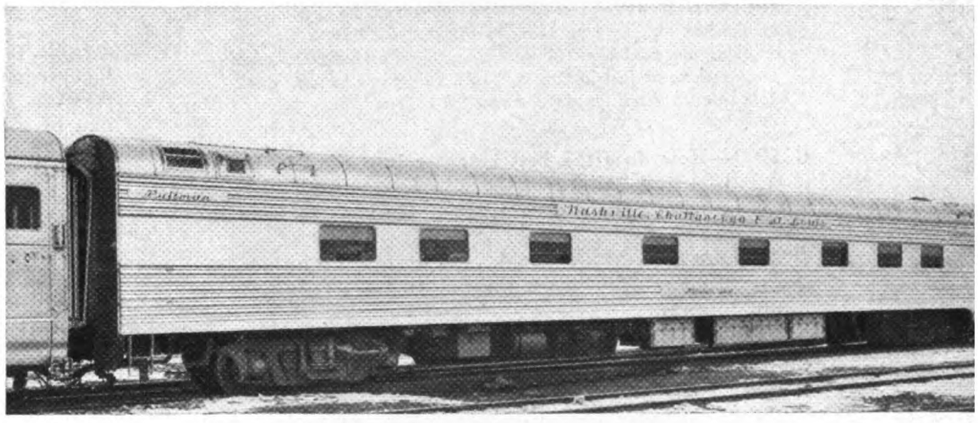
The electrician started prying the wires apart and found that this caused the battery field contactor to drop open. He knew that he was hot on the trail of trouble. Separating the wires revealed that the PC wire was short-circuited with wire GF-52. Retaping the wires corrected the trouble and the case of the jumpy jeep was closed.

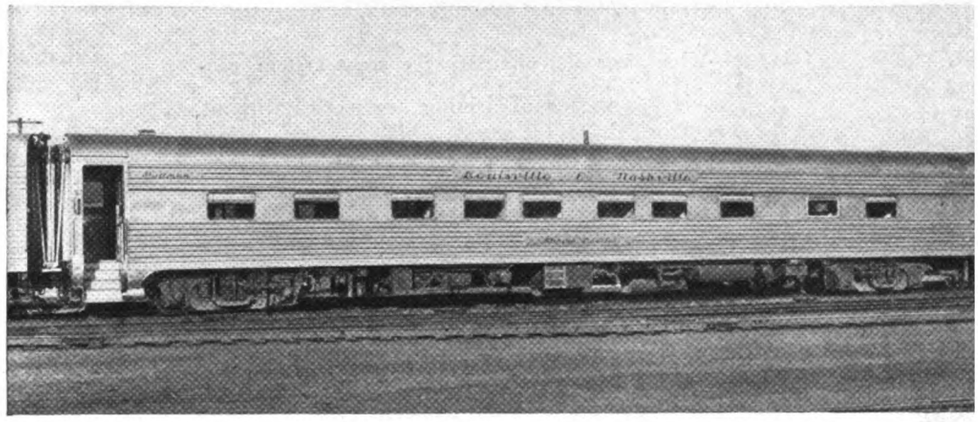
Solving this trouble involved the same sort of planning that was followed by the negro who was sent out to find a mule that had strayed away. Asked how he located the mule so quickly, he replied: "Ah just thought about where Ah would go if Ah was a mule, and that is where Ah found him."

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.



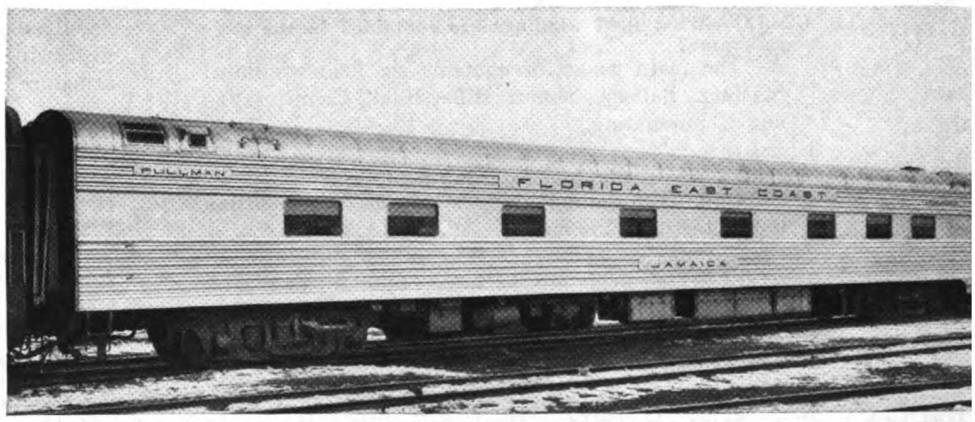


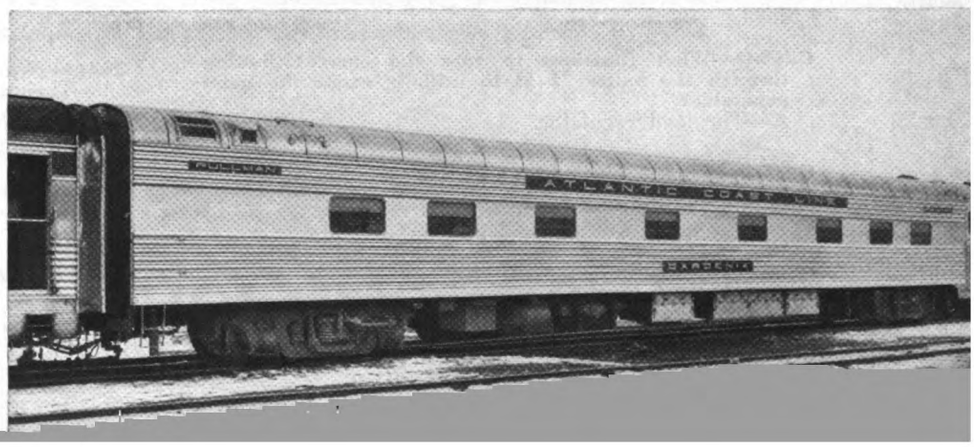




"Dixieland" operation

The first cars equipped with G.E.'s new GMG-162 were delivered to the Canadian National and Rock Island railroads in 1954. In the short time since then, orders have been received from: Atlantic Coast Line, Nashville, Chattanooga and St. Louis, Chicago and Eastern Illinois, Florida East Coast, Louisville and Nashville.





Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G259-Q—How does the battery enter into the picture?
A—A 64 volt battery in the low voltage system is the source from which power is taken to start the engine.

G260-Q—What takes place once the engine is started?
A—The auxiliary generator then takes on the job of supplying power to the low voltage system.

G261-Q—What does the alternating current system include?
A—An alternating current generator (called an alternator) includes four engine cooling fan motors and four traction motor blower motors.

G262-Q—What does the alternating current system provide?
A—Provides a means of driving accessories without the use of belt drives, at speeds which vary according to the speed of the engine.

Main Generator

G263-Q—What is the nominal generator voltage?
A—600 volts.

G264-Q—Does this figure vary?
A—Yes, the voltage varies with engine speed and the condition of operation of the locomotive.

G265-Q—What field windings are contained in the main generator?
A—The main generator contains six field windings: Starting, Battery, Shunt, Differential, Compensating and Commutating.

G266-Q—When only, is the starting field used?
A—Only when the main generator is used as a starting motor to rotate the engine.

G267-Q—Which fields are the more important as regards locomotive operation?
A—The shunt and battery fields; these two fields provide the main excitation of the generator.

G268-Q—Describe the battery field.
A—The battery field is a low voltage externally excited field.

G269-Q—What functions to vary the current flowing through the battery field to initially excite the main generator?
A—The load regulator.

G270-Q—What is the purpose of this variation of battery field excitation?
A—Variation of battery field excitation controls the power output of the main generator.

G271-Q—What controls the flow of current to the battery field circuit?
A—The battery field contactor opens or closes the current to the battery field.

G272-Q— Is the main generator self-excited? If so, how is this accomplished?
A—Yes, the main generator is self-excited to the extent of the excitation produced in the shunt field.

(Manual 2310, page 303)

G273-Q—Describe the shunt field.
A—The shunt field is a high voltage field, its excitation varying with the voltage of the main generator.

G274-Q—What serves to control the circuit to the shunt field?
A—A shunt field contactor.

G275-Q—How much does this contactor operate with relation to the operation of the battery field contactor?
A—Interlocks are built into the shunt field contactor so that this contactor must close before the battery field contactor can close.

G276-Q—How are the differential, compensating and commutating fields connected and what is their purpose?
A—These fields are permanently connected, and are a matter of engineering design, providing generator characteristics and proper commutation.

Traction Motors

G277-Q—Describe the traction motors.
A—The traction motors (Model D-27) are direct current, series wound motors geared to the wheel axles.

G278-Q—How are the motors reversed?
A—By changing the direction of current flow in the field windings, the direction of current flow in the armature always being the same.

G279-Q—What functions to reverse the current flow in the traction motor field windings?
A—A reverser drum operated by electro-pneumatic control.

G280-Q—How are the traction motors cooled?
A—By alternating current driven blowers, one for each motor.

G281-Q—Where are the traction motor blowers located, and how do they operate to cool the traction motors?
A—They are mounted on the floor of the engine room and blow air through flexible ducts to the traction motors.

G282-Q—What is the speed of the traction motor blowers?
A—Their speed varies with the speed of the engine; this is due to the engine speed varying the frequency of the alternator.

(Continued on page 68)

Burlington fast freight, diesel-powered, rounds Horseshoe Curve near Crawford, Nebraska.

How to Give Freight a Fast Ride

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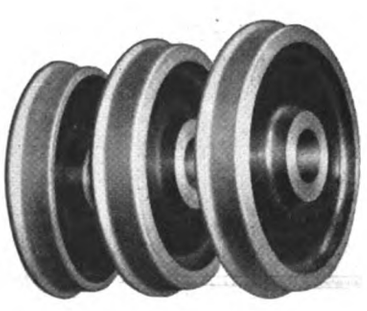


(*Continued from page 62*)

G283-Q—What limits the maximum permissible speed of the locomotive?
A—The maximum permissible top speed of the locomotive is limited by the safe RPM of the traction motor armature.

G284-Q—Such being the case, what provides for a high speed train operation?
A—A high speed gear ratio is required.

G285-Q—What is needed to start and use full horsepower with low speed tonnage trains, without overheating or damaging the electrical equipment?
A—A low speed gear ratio is needed for such a condition.

Reversing Locomotive

(*Manual 2310, page 304*)

G286-Q—What action takes place when the reverse lever is moved to forward or reverse position?
A—The respective forward (FOR) or reverse (REV) magnet valves located in the electrical cabinet are energized.

G287-Q—What takes place when either of these magnet valves is energized?
A—When either magnet valve is energized, it allows control air to pass through the valve, moving the reverser to the desired direction.

G288-Q—How are the positions indicated on the reverser drum?
A—With four long segments showing on the reverser drum, reverser is in forward; eight short segments can be seen when in reverse position.

Transition

G289-Q—What is the term transition applied to?
A—This term is applied to the changing of traction motor connections on a diesel-electric locomotive.

G290-Q—Why is it necessary to make such changes?
A—So that full power may be obtained from the main generator within range of current and voltage limits.

G291-Q—Briefly then, what is transition?
A—A method of adjusting the traction motor "back pressure" (counter e.m.f.) bucking the input of power from the main generator, so that this back pressure will not become too high at higher speeds nor too low at lower speeds.

G292-Q—With what type of transition are the present F-7 locomotive basically equipped?
A—Three relay automatic transition.

G293-Q—What relays are used with three relay transition?
A—Relays FTM, FTP and BTP are used to affect fully automatic forward and backward transition.

G294-Q—Is there any provision for operating units so equipped manually?
A—No.

G295-Q—What provision has been made for dynamic braking or use in multiple operation with older units not equipped for automatic transition?
A—Lead units are equipped with transition levers for this purpose.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F239-Q—How does the oil flow at higher engine speeds?
A—A relief valve will open at 20-25 pounds, to allow part of the oil to flow through an external by-pass around the 6 element filters.

F240-Q—What takes place in the event that the oil cooler or strainer is plugged?
A—Plugging of the oil cooler or strainer will open an external by-pass in the pump and cause the engine to shut down from low oil pressure if sufficient drop occurs.

F241-Q—What is the setting of the pump relief valve?
A—Seventy pounds and it is not adjustable.

F242-Q—What affords low oil pressure protection?
A—An oil line from the lower engine lubricating oil header to the engine governor provides connection to the low oil pressure shut down feature, located in the governor.

F243-Q—How is the oil level measured?
A—Oil level is measured at the dip stick located in the engine sub-base on the left side of the engine.

F244-Q—When should the oil level be checked and what should it be?
A—The lube oil level should be checked at the start of every run, and should be between the FULL ENGINE and the ADD OIL marks.

(*Bulletin 1706—117-A, page 3*)

F245-Q—How should the gage be read if engine is running when oil level is checked?
A—Read the side of the gage marked ENGINE RUNNING.

F246-Q—How should the gage be read if the oil level is checked with engine stopped?
A—Read the side of the gage marked ENGINE STOPPED.

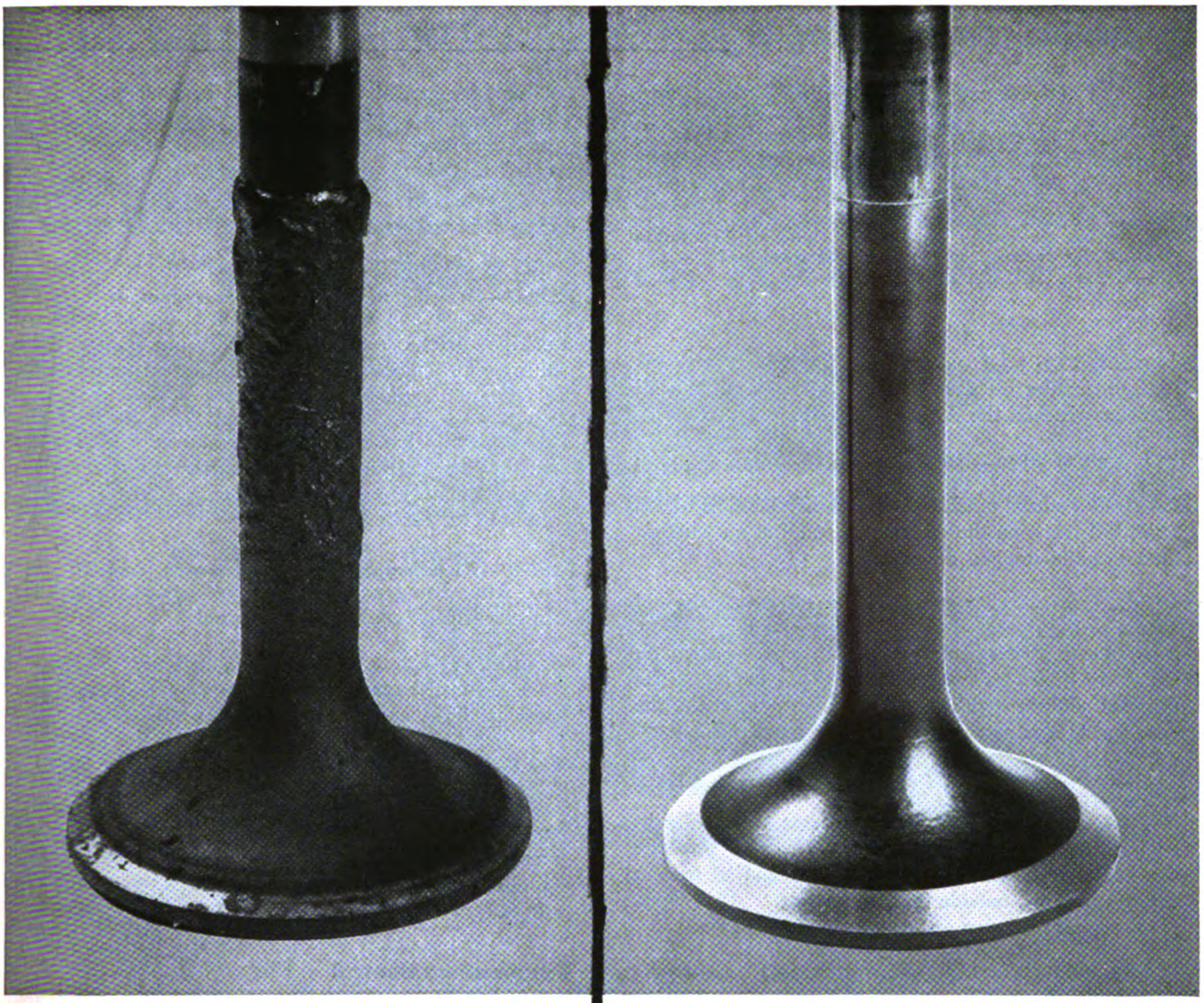
F247-Q—Describe the gaging operation.
A—Unscrew bayonet gage ,remove and wipe clean of oil. Insert to full thrust but do not screw onto pipe. Withdraw and read proper side. Replace in pipe and screw-down snug.

Filling System

Initial Fill

F248-Q—What should the oil level be when the system is being filled for the first time?

(*Continued on page 70*)



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Favorite of the men in the shops

Pennsalt Multi-Metal Cleaner is a Trade Mark of Pennsylvania Salt Mfg. Co.

Pennsalt Chemicals

(*Continued from page 68*)

A—Oil should be added until the level reaches the OIL CHANGE-NEW FILL mark on the ENGINE STOPPED side of the dipstick.

F249-Q—After the engine has been run and oil distributed through the system, what should the level be?
A—At the FULL ENGINE mark.

Adding Oil

F250-Q—At what level should oil be added?
A—Lubricating oil should not be added until the oil level has reached the ADD OIL mark.

F251-Q—When oil is added, at what mark should the level be shown?
A—Until the level reaches the FULL ENGINE or FULL SYSTEM mark on the dipstick, depending on whether the engine is stopped or running.

Draining System and Changing Oil

F252-Q—At what point is the system drained?
A—From the bottom of the engine crankcase through the drain pipe at the pump end of the engine. The drain is equipped with a valve at pipe plug at the the end, and is located just ahead of the rear truck.

F253-Q—Describe the initial operation for changing lubricating oil.
A—(1) Open drain valves at oil filter and cooler in engine room. Filter and cooler will drain into the crankcase. (2) Remove pipe plug in end of system drain pipe on outside of locomotive. (3) Open crankcase drain valve on outside of locomotive.

(*Bulletin 1706—117-A, page 4*)

F254-Q—What should follow?
A—When oil flow stops, close crankcase and filter and cooler drain valves and replace pipe plug in the end of drain pipe. Renew filter elements and clean strainer.

F255-Q—Describe the operation for re-filling.
A—(1) Refill system to OIL CHANGE-NEW FILL mark on the ENGINE STOPPED side of the dipstick. (2) Start engine and allow oil to circulate and fill system.

F256-Q—What should be done next?
A—Stop engine, allow oil to settle in crankcase and take level reading on bayonet gauge. Level should be at the FULL ENGINE mark on ENGINE STOPPED side of dipstick. If necessary add enough oil to bring the level up to FILL ENGINE mark.

F257-Q—How is the 6 element oil filter serviced?
A—A drain valve is provided to drain the filter into the crankcase. A plugged opening is also provided at the rear of the filter, draining into a waste hose. Drain Valve is located by the filter.

Low Lubricating Oil Pressure

F258-Q—Give some causes for low lubricating oil pressures.
A—Some causes are dirty strainer, insufficient oil, oil diluted by fuel oil or water, line broken, pump defective, cooling water above 195 degrees F, and filter or cooler drain pipe open, by-passing oil back to the crankcase.

GENERAL DESCRIPTION

(*Bulletin 1706—118-a, page 1*)

F259-Q—Describe the cooling water system.
A—A single cooling water system is utilized with one engine driven centrifugal pump circulating water through the engine, radiators and lubricating oil cooler.

F260-Q—How does the water circulate?
A—Water is drawn from the engine water tank by the engine driven pump, circulating water through the engine cooling passages to two parallel banks of radiators in the cooling hatch.

F261-Q—What happens after the water is cooled?
A—After being cooled, the water passes through the lubricating oil cooler to the engine.

F262-Q—What serves to cool the radiators?
A—Air for cooling the radiators enters through shutters on the sides of the locomotive unit.

F263-Q—What mechanical medium provides for air circulation?
A—The air is drawn through the radiators and expelled through openings in the roof by four alternating current motor driven fans mounted at the top of the cooling hatch. (Three fans are installed in 1,600 hp units.)

Temperature Control

F264-Q—How are the fan motors connected?
A—The fan motors are electrically connected to the alternators by contactors located in the lower cabinets near the left engine room side doors.

F265-Q—What operates the fan contactors?
A—The fan contactors are energized by electric contacts in a pneumatic step controller located in the upper cabinet by the left engine room side door.

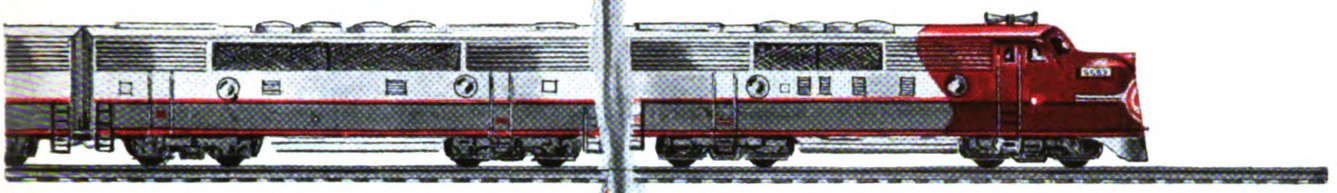
F266-Q—What is the purpose of the additional contact on the step controller?
A—An additional contact operates the shutter magnet valve.

F267-Q—What is the function of the magnet valve?
A—The shutter magnet valve controls air at main reservoir pressure to the two shutter operating cylinders.

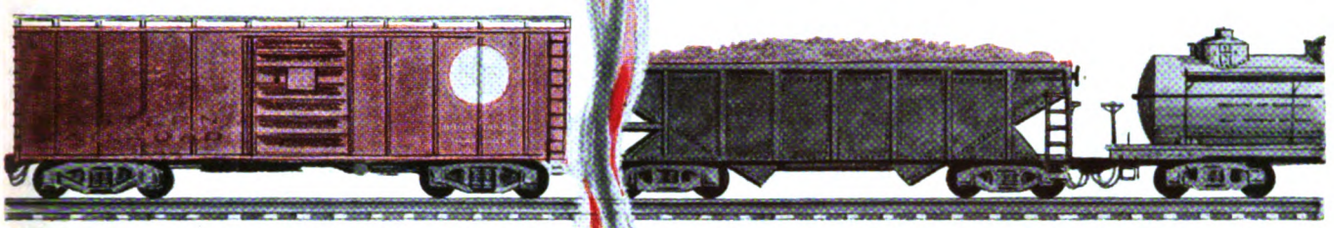
F268-Q—What operates the pneumatic step controller?
A—The pneumatic step controller is operated by a 0-17-lb range in temperature control air pressure, regulated by a thermostat located in the water inlet line to the oil cooler.

F269-Q—What does the air pressure accomplish?
A—This air pressure rotates a camshaft to make the electric contacts close in sequence.

No capital investment required to



ELIMINATE THE MAJOR



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U. S. Ever-Pac has A.A.R. approval for application to a specified number of cars which move in general interchange service (Docket No. L-129). We will be happy to have an engineer call on you with full details. Write or get in touch with address below.

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Interchange Rules

This is the seventeenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

180-Q—Where certain types of A.A.R. No. 18 Brake Beams are designed so that it is possible to readily remove the heads, would it be proper to render charge versus car owner where repairing line elected to make separate renewal of head at car in such cases?

A—Such work would be considered as temporary repairs, no bill. See Interpretation No. 11 to Rule 107.

181-Q—What is the proper method of charging for Universal UX-5 truck spring plate?

A—Inasmuch as the patent rights on Universal UX-5 truck spring plate expired on June 6, 1950, charge for same should be computed on weight basis at price per pound specified in Item 188 of Rule 101.

182-Q—In forwarding badly damaged car to home road for repairs loaded on another car, is the handling line required to conduct a special investigation to determine the owner of the car in question?

A—The car owner is considered as that represented by the reporting marks on the car. Rule 112 was not intended to require investigation beyond the reporting marks to establish an owner which might be different from that indicated by initials or name stenciled on car.

183-Q—What is the proper labor charge for renewal of Barber Stabilizer Friction Castings?

A—Labor charge for application of Barber Stabilizer Friction Castings to Barber Stabilized Freight Car Truck should be on the basis of Item 156 of Rule 107.

184-Q—Would it be advisable to incorporate provisions in the Interchange Rules to provide handling line responsibility for tar applied to cracks between floor boards of box cars?

A—It would be very difficult to establish a rule of this nature which would work out equitably for all concerned. Such a rule would place a very difficult burden on interchange inspectors as it would be necessary to open the doors on all empty house cars to determine whether or not this condition existed. Furthermore, this condition could not be detected in interchange on loaded house cars with the result that in some cases the road which unloaded the car and forwarded same empty, might be subsequently carded at the next interchange point, even though entirely innocent with respect to this condition.

185-Q—Would it be advisable to establish definite periods for reweighing empty tank cars similar to the provisions now applicable to other types of freight cars?

A—Effective January 1, 1916, a requirement was placed in the Interchange Rules providing that tank cars should be weighed and stenciled to show their lightweights, this work to be performed by the tank car companies only, or by their authorized representatives. This regulation was made effective on recommendation of the Operating-Transportation Division of the A.A.R. as they needed these lightweights for the information of train crews in making up train tonnage.

Tank cars are used for the transportation of a great variety of products, practically all of which are in liquid form. Tank car companies have gone to a great amount of expense to accurately determine the gallonage capacity of the tank of every car. These capacities are published in the United States, Canadian and Mexican Railroads Freight Tariff No. 300-G issued by W. J. Prueter, Agent, 516 West Jackson Boulevard, Chicago. Illinois. Capacities are also published by the tank car owners in units of gallons in outage tables. Whenever the weight of the commodity is required, such weight is obtained by converting to pounds from accurate measurements of gallons.

There are some products which adhere to the inside of the tanks and after a car has been unloaded there is a variance in the so-called lightweight when car is empty.

The complete cleaning of the inside of tanks is not only hazardous but is an expensive operation. This cleaning would be necessary every time cars were lightweighed if re-lightweighing was a requirement at regularly specified intervals.

The American Petroleum Institute's Code Committee on Tank Car Quantities eliminated weighing of cars in their Code as an alternative procedure because "the accuracy tolerance in weighing is variable and not sufficiently good for inclusion in a code."

Furthermore, most commodities shipped in tank cars are sold on a gallonage basis and the weight of the commodity can be readily obtained by multiplying the number of gallons contained in the tank by the weight per gallon.

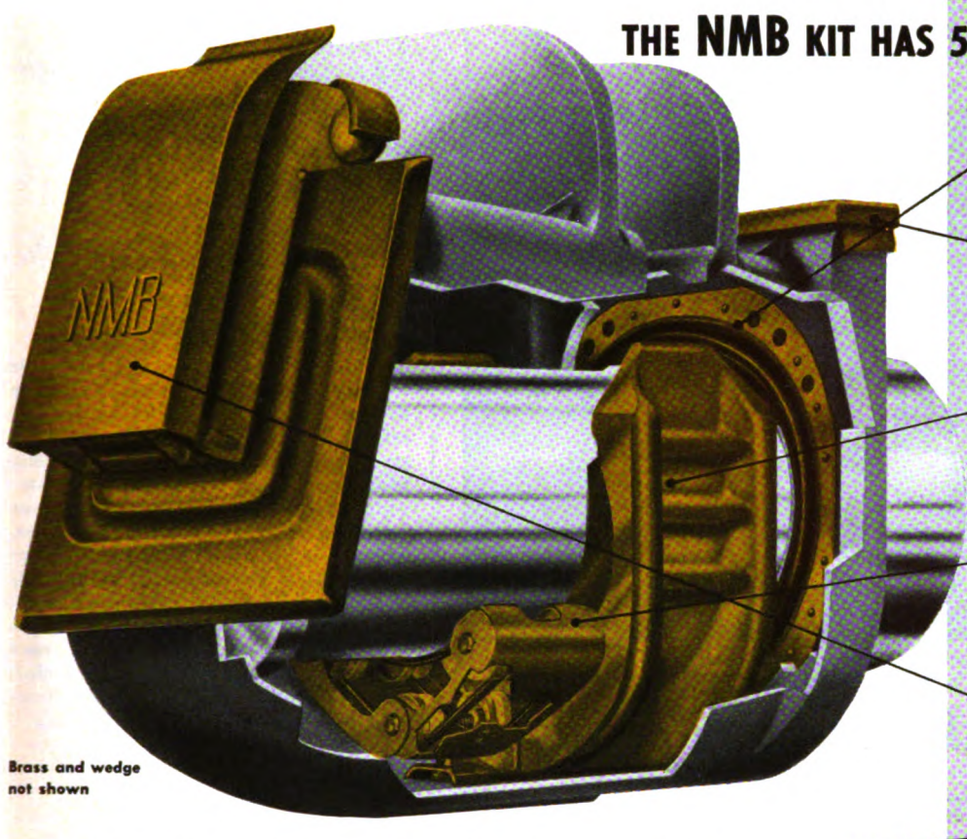
186-Q—Do the requirements of Paragraph (f-2) of Interchange Rule 3 apply to depressed, well-type or "piggy-back" types of flat cars?

A—The requirements of Paragraph (f-2) of Interchange Rule 3 do not apply to depressed, well-type or "piggy-back" types of flat cars, or any other flat cars of special design. Cars in these categories are considered as being of special design, most being equipped with anchorage details which meet the requirements for special loads used on this type of equipment.

187-Q—Where a pair of wheels is removed account slid flat and journal length on 5 by 9 journal is found to be 9⅝ in., which renders the axle as scrap, who is responsible for renewal of such axle?

A—The party responsible for change of wheels account slide flat is also responsible for the renewal of the axle having journal length of 9⅝ in. in such cases.

A.A.R. Approved for Interchange Service on 10,000 Cars



Brass and wedge not shown

THE NMB KIT HAS 5 PRINCIPAL PARTS

A. OIL SEAL. Keeps oil in; dirt, water, brine and snow out.

B. DUST GUARD WELL COVER and FILTER. Exclude dripping water, snow, brine; yet permit breathing.

C. JOURNAL GUARD BEARINGS. Eliminate axle damage during humping, coupling, starting or heavy braking.

D. OIL CIRCULATOR. Lubricates bearings with ½ turn of axle. Guarantees continuous lubrication. Bearings run 50° cooler.

E. JOURNAL BOX LID and WAFFLE GASKET. Provide tight oil and water seal at front opening. Eliminate vibration wear.

The NMB Sealed Journal Box Kit is the result of applying modern automotive engineering principles to a century-old railroad problem. Developed by NMB in collaboration with 3 major western railroads, the NMB Kit is a modern, sealed oil bath lubrication and dirt exclusion system for solid bearing journal boxes.

Installation is made in the regular standard A. A. R. journal box; no alteration is required. Waste packing normally used for lubrication is removed. NMB Kits for 5″ x 9″, 5½″ x 10″ and 6″ x 11″ A. A. R. standard solid bearing journal boxes are available.

NEW MANUAL describes simple, inexpensive installation steps. PARTS & PRICE LIST shows all Kit parts, gives quantity purchase discounts. Sent immediately without obligation.

For complete information or consultation at your headquarters, write or telephone NMB Railway Equipment Division offices listed below.

NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS

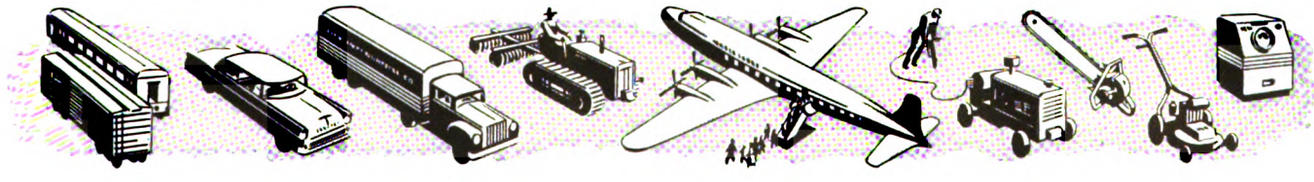
3067

NATIONAL MOTOR BEARING CO., INC.

GENERAL OFFICES: Redwood City, California
PLANTS: Redwood City, Downey and Long Beach, California; Van Wert, Ohio
RAILWAY EQUIPMENT DIVISION OFFICES
New York 17, N. Y.: Room 537, 527 Lexington Ave. PLaza 3-6647
Chicago 3, Illinois: Room 4113 Field Bldg., 135 S. LaSalle St. FRanklin 2-2847
Redwood City, California: Broadway at National Ave. EMerson 6-3861

NMB has manufactured tens of thousands of oil seals for roller bearing cars and over 1,000,000,000 oil seals for AUTOMOBILES • TRUCKS • TRACTORS • AIRCRAFT • MACHINES • HOUSEHOLD APPLIANCES

*Based on operating experience of major Class I railroads.



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Gaskets—Packings—Molded Rubber Rings for diesel locomotives . . .

Section of Garlock's diesel parts stock room

NOW pre-stocked in handy packages, ready for immediate shipment

Packaging and labeling diesel parts after inspection.

GARLOCK diesel replacement parts —gaskets, packings and molded rubber rings—are packaged in convenient quantities for ease in handling, storing and redistribution to shop men, overhaul shops and terminal points.

All packages are labeled for instant identification—no cross-reference parts list needed.

Garlock diesel gaskets, packings and molded rubber rings are giving completely satisfactory service on leading railroads. Specify Garlock diesel replacement parts and write us for complete parts-and-price list.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
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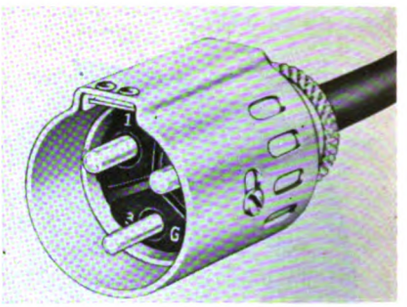
Branch Offices in Most Principal Cities

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

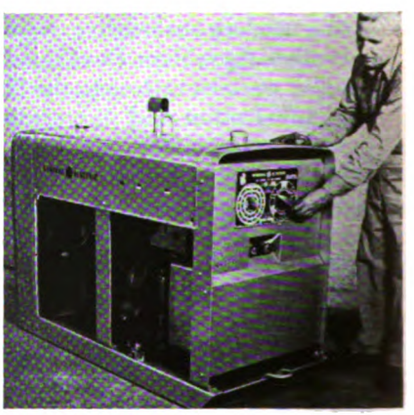
NEW DEVICES

(Continued from page 11)



Plug and Receptacle

The Midget Triploc plugs and receptacles for portable and detachable electrical devices are assembled with individually renewable parts. The interchangeable and reversible contact units have round prongs which are claimed to give positive contact with good mechanical strength. The contact units also have raised insulated arc barriers for increased creepage distance between poles and to ground. The plugs are self-locking and need only a slight twist to release them. Contacts are protected by an extended housing shell. Ratings are 15 amp at 125 volts, and 10 amp at 250 volts. *Pyle National Company, 1340 N. Kostner avenue, Chicago 51.*

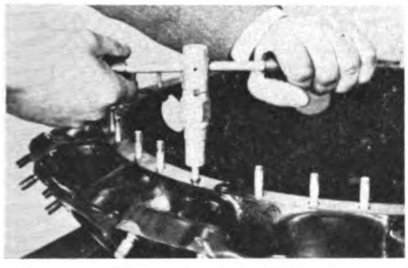


Engine-Driven Welder

This 200-amp engine-driven welder has been designated the Type WD20AG. It is rated for a current range of 40 to 250 amp and will handle all d-c or a-c/d-c electrodes from 1/16-in. to 1/4-in. The unit is powered with a liquid-cooled Hercules engine with a fuel tank capacity for 13 hours of full-load operation. The engine has a cartridge-type oil filter and an oil-bath air cleaner. The gear-driven governor is said to give close control and rapid response.

The welding generator is driven through a flexible metal-disc coupling. Its laminated frame has dove-tail mounted poles and precision wound coils. Brushholders are fixed at the proper setting and brushes are

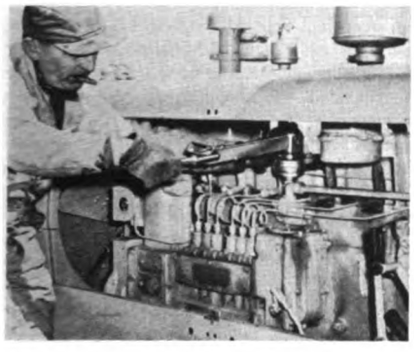
held by constant force springs. ,Generator control consists of a tap switch and current rheostat. There are six electrode taps. All operating parts are protected by a full length sheet steel canopy. *General Electric Company, Schenectady 5, N. Y.*



Stud Driver

Three important stud operations are performed by this collet-type tool, the Service "Bi-Way" Studder. It extracts studs without damaged and warped threads, and permits their reuse. For production stud driving, the tool features automatic gripping action, instant shifting to pulling action, and fully adjustable control over the driving depth so that uniform exposed stud lengths can be produced. For the removal of broken or stripped studs, a serrated collet is available that will extract studs with as little as ⅛-in. exposed length.

Five models cover the range of stud sizes from 3/16-in. to ¾-in. for all styles of thread. The driver can be adapted to hand or power drive and a special long narrow nose model is available. *E. V. Nielsen, Inc., 128 Broad street, Stamford, Conn.*



Geared-Head Wrench

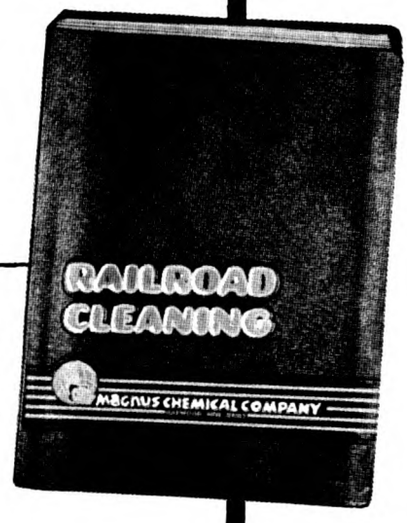
The X-4 geared-head wrench is a small, compact unit that serves as a multiplier between ratchets or torque wrenches, and sockets or other attachments. Heavy assembly or disassembly operations requiring a rotary effort of over 200 ft-lb can be done without dangerous snap or jarring action. The unit is lightweight, portable, and can be used in close quarters. It has a four-to-one ratio, and, when used with a torque wrench, simplifies the tightening of threaded parts to a specific torque.

The X-4 has a drop-forged, heat-treated, chrome-moly steel head. All highly stressed

Keep Costs Low... Efficiency High

with

MAGNUS CLEANING METHODS



In railroad operations where modernization has been adopted, Magnus Cleaning Methods have amply proved their superiority in every phase of cleaning.

On Diesel Cleaning...

Magnus Decarbonizing Cleaner in Magnus Aja-Dip Cleaning Machines will reduce hand labor on cleaning diesel parts by close to 85% . . . will cut the time required in half . . . and will save more than half of the cleaner costs. Magnus Diesel Magnusol for cleaning the exteriors of road engines will cut manpower and time in half . . . and will do a much better cleaning job. In diesel cabs, Magnus 5-RR will insure faster cleaning at greatly reduced cost.

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Magnus Cleaners and/or Machines offer you similar opportunities to cut costs and improve results . . . from cleaning A-frames or blocks, trucks and underbodies, engine pits, oily concrete areas, signal and communications equipment, to the routine jobs of cleaning linoleum and tile in washrooms, offices or stations, coach interiors, head liners, etc.

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Railroad Division

MAGNUS CHEMICAL CO., INC.

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Please send us a copy of the Magnus Railroad Cleaning Manual.

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RAILROAD_____

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parts, including the detachable anchor bar, are made of special heat-treated alloy steels. Head and shafts are sealed and lubricated for life. Drive is through planetary gears. *Bonney Forge & Tool Works, Allentown, Pa.*

Battery Charger

Lead-acid or nickel-alkaline batteries on six industrial trucks can be charged at the same time with the HX6 Charg-O-Matic battery charger. This six-circuit model is intended for central service charging stations. The manufacturer claims that operation is simple and that there is no danger of overcharging. The control cabinet and motor-generator are supported on a welded I-beam base and are delivered as a package ready to install. Charging cables for each circuit are supplied. The front of the control cabinet is hinged for easy inspection. *The Hertner Electric Company, 12690 Elmwood ave., Cleveland 11, Ohio.*

Steam Cleaners

An efficient heat exchanger and a powerful pumping system account for the high volume output of the Model K line of steam cleaners. Gas or oil fired, these compact units have capacities up to 3,000 gal. per hr. The heat exchanger reduces fuel consumption because the water temperature is raised to 100 deg before it enters the main heating circuit.

The piston feed pump runs in oil and has stainless-steel ball-check valves to provide high volume output and dependable operation. No clay or firebrick are used in the cabinet and all the controls are installed on the front. A special control automatically maintains a uniform acid or alkaline content in the cleaning solution. *Kelite Products, Inc., 1250 North Main street, Los Angeles 12.*

Paint Brush Conditioner

A vapor solvent and an air-tight container combine to condition paint brushes so that the bristles are soft and ready for use. The industrial-style container with an overall height of 15-in. holds eight 6-in. brushes or 12 to 14 smaller ones. The brushes are suspended in the air-tight space surrounded by the solvent vapor which evaporates from a wick and liner. The solvent, used on both nylon and natural-bristle brushes, is claimed to dissolve the binding oils and resins in paint, varnish, enamel, lacquer and shellac. The manufacturer claims this treatment to be more effective than soaking. *Wisconsin Laboratories, Inc., Dousman, Wis.*

Protective Coating

Railroad Cocoon is a sprayable protective coating developed especially for the railroad industry to upgrade box and hopper cars for handling Grade A commodities. It not only prepares cars for merchandise service, but can make them suitable for the bulk handling of grain, powdered coal and china clay. It is a tough vinyl plastic which is still flexible at temperatures down to 50 deg below zero and it is also satisfactory up to 180 deg above zero.

The strength and flexibility of this product are such that a coating will not tear or

Welding industry's greatest cost-cutting twins . . .

IDEALARC and JETWELD

Never before has any combination of welder and electrode offered such a cost-saving potential in faster, easier welding. Here's why:

Idealarc for easy, efficient operation . . . first welder to give you *both*
AC AND DC WELDING CURRENT
with Dual Arc Control where you select "soft arc" or "forceful arc" on AC as well as DC
and in addition . . . hot starting on DC as well as AC

Jetweld for high-speed operation . . . first universally adopted iron-powder electrode for
extra-fast welding
high deposition
drag operation
LET LINCOLN DEMONSTRATE HOW YOU CAN PROFIT . . . NOW. Send for Bulletin 1343. Write . . .

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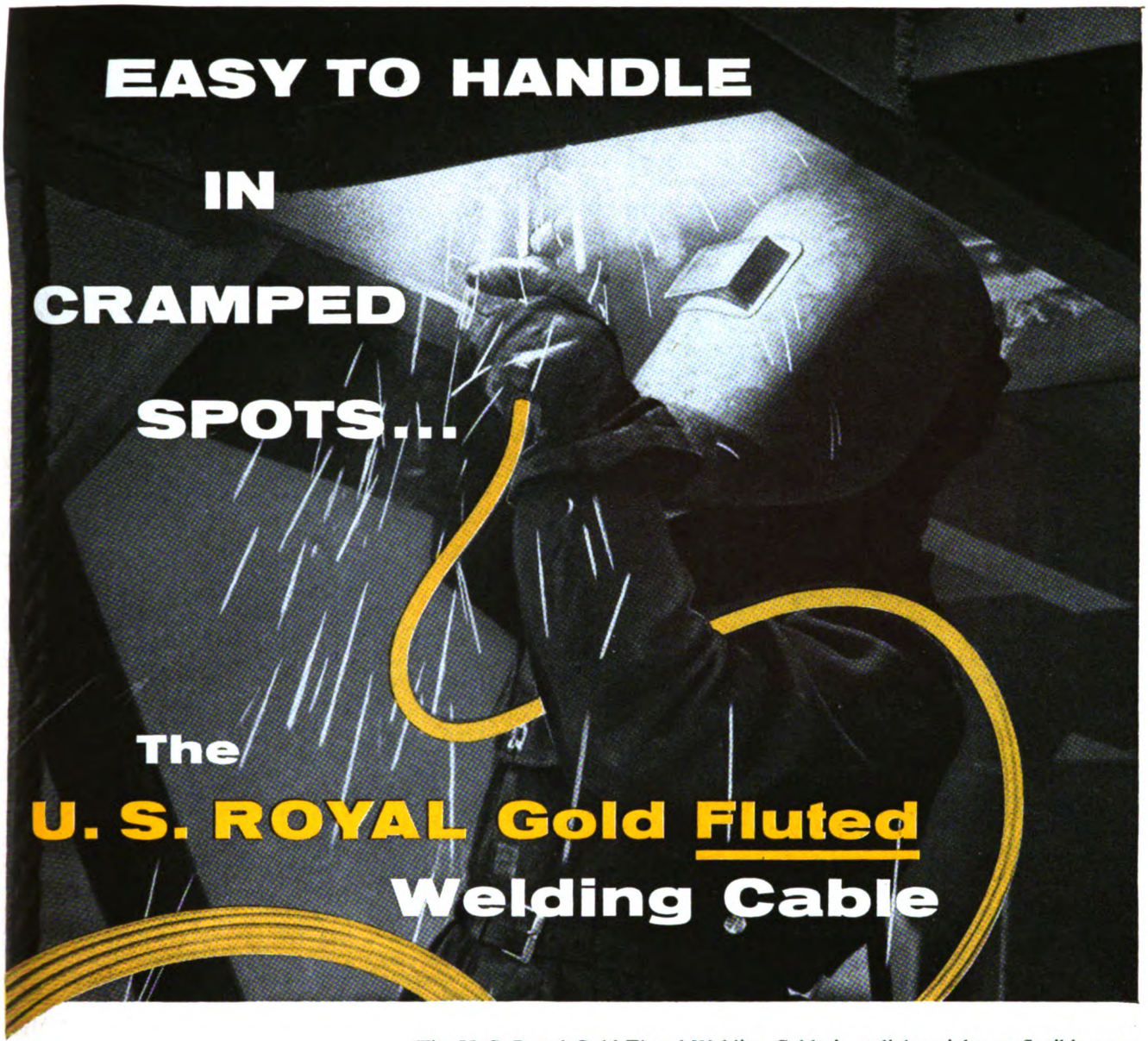
The World's Largest Manufacturer of Arc Welding Equipment



NEW!
HIGH IN VISIBILITY,
FLEXIBILITY,
TOUGHNESS;
COOL GRIP!

The U. S. Royal Gold Fluted Welding Cable is so lightweight, so flexible even at low temperatures that it makes welding in cramped locations a simple matter. U. S. Royal coils easily, doesn't kink or tangle. It cuts down "drag" and operator fatigue.

U. S. Royal Gold is easier to see! Its bright yellow color is visible in the grit and grime of the shop floor. Workmen don't trip over it, or get it entangled with equipment. Also, the yellow jacket provides an excellent contrasting color to black for conductor identification where two cables are required for welding machines.

The greater flexibility of U. S. Royal Gold also pays off in greater dependability at terminal connections. Lower maintenance costs than with any other welding cable.

COOLER TO HANDLE! The unusual *fluted* jacket provides greater surface area and thereby dissipates heat faster.

SUPERIOR IMPACT RESISTANCE! Proved by tests to be greater than that of conventional constructions.

The special 60% natural rubber insulation and the 60% natural rubber jacket give U. S. Royal Gold an unsurpassed resistance to moisture. *Made only by United States Rubber Company*. Available at your electrical supply house.

Write address below for free folder that gives facts demonstrating the superiority of U. S. Royal Gold Fluted Welding Cable.

US RUBBER

UNITED STATES RUBBER COMPANY
Electrical Wire and Cable Department • Rockefeller Center, New York 20, N. Y.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number(s) on coupon below to receive desired information; requests will be handled direct by manufacturers.

1. BATTERIES. *C & D Batteries, Inc.* 3 bulletins describe, illustrate and give specifications on batteries for control, switchgear, emergency lighting and auxiliary power (Bulletin CP-538 "Hi-Power Batteries"; Bulletin CP-536 "Plastical Lead-Calcium Batteries"; Bulletin CP-537 "Plasticell High-Tensile Alloy Grid Batteries). *Write-in bulletin number.*

2. DIESEL RAILCARS. *Maschinenfabrik Augsburg-Nurnberg A.G.* 12-page colorful booklet describes diesel-mechanical, diesel-hydraulic and diesel-electric railcars, 2, 3 and 4-coach units; with floor plans.

3. RAILROAD EQUIPMENT. *Maschinenfabrik Augsburg-Nurnberg A.G.* Brochure "M.A.N. For Railroad Traffic" depicts railroad equipment, diesel engines, steel buildings, turntables and bridges as produced by the M.A.N. works at Nurnberg, Augsburg, Gustavsburg (Germany).

4. CRANES. *Star Machine & Tool Co.* Data available on the versatile and low-cost Star Hydro-Lift Cranes in ½ ton, 1 ton and 2 ton capacities, and in hand-operated, electrically operated, and combination manual-electrically operated models.

5. STAINLESS FASTENERS. *All-metal Screw Products Co.* 8-page brochure (P-126A) lists and illustrates stainless fasteners, includes style and size data about stainless screws, bolts, nuts, washers, rivets, and "AN" fasteners.

6. CLEAN FLOORS. *Multi-Clean Products.* 8-page folder (560) "Here's Everything You Need For Better Floor Care" shows the complete Multi-Clean line; describes and illustrates floor and scrubbing machines, industrial vacuum cleaners, sanding machines, floor cleaners and sealers.

7. PULLEYS. *Equipment Engineering Co.* 8-page brochure describes, illustrates and lists advantages of Hi-Lo automatic variable speed pulleys and Hi-Lo systems; includes graphs, diagrams, cutaway views and in-action photos.

8. AIR TOOLS. *Ingersoll-Rand.* 52-page 3-color catalog "Impactools" (5200-A) describes, illustrates and gives specifications for the complete line of Air Impactools; includes on-the-job application photos and case history studies.

9. SOLDERLESS WIRING DEVICES. *Aircraft-Marine Products.* 28-page multi-color booklet (120054) "The Measure of a Company" deals with the growth of the solderless wiring industry and A-MP's development of techniques and tooling to meet specific requirements.

10. PISTON RINGS. *Precision Piston Rings.* 8-page brochure gives technical data and complete descriptions of the physical properties of the eight alloys used in Precision Un-Breakable Wrought Alloy Piston and Sealing Rings.

11. PLUGS & RECEPTACLES. *Joy Mfg. Co.* 12-page 2-color bulletin (B59) "Joy Electrical Connectors for Industry" illustrates and describes with pertinent details electrical plugs and receptacles for standard and special industrial needs.

12. GLOBE VALVE. *Lunkenheimer Co.* 4-page circular (602) describes, illustrates and gives dimensions on LQ600 bronze globe valve with Brinalloy seats and discs.

13. PHOSPHATING. *Turco Products, Inc.* 4-page pamphlet "A Better Bond For Organic Finishes" describes the complete Turcoat line of phosphating compounds; includes Phosphating Reference Chart outlining purpose of each Turcoat material.

14. PATTERNED METAL. *Rigidized Metals Corp.* Pocket-sized folder "Rigidized Digest" is a quick-reading story of stainless Rigid-Tex metal in 3 parts: cost advantages, end use advantages, extra dividends; shows typical use by Missouri-Pacific for LCL tote box.

15. CENTRIFUGAL PUMPS. *LaBour Co.* 12-page 2-color bulletin (G-1) "LaBour Packingless Self-Priming Centrifugal Pumps" describes and illustrates the pump; includes cross-section diagram showing parts, installation instructions and operating data.

16. REFRIGERATING UNITS. *Carbofrezer Co.* 4-page 2-color folder lists advantages of the Carbofrezer refrigerating unit, specifications, cross sectional diagram, and presents a letter testimonial by a leading railroad on its effectiveness in use.

17. CUTTING TORCH. *Arcair Co.* 12-page pocket-size booklet "Case Histories on the Use of The Arcair Torch" shows many detailed on-the-job reports on use of Arcair cutting and gouging torch.

18. SAFETY SIGNS & TAGS. *Ready Made Sign Co.* 48-page 5-color catalog "Ready Made Signs for Safety" describes and illustrates in actual color over 2,200 of its stock metal signs and safety tags which aid in preventing accidents in factories, shops, and business establishments.

Reader Service Department **JULY, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

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Also, please send me additional product information as follows: (company, product & page number) .....

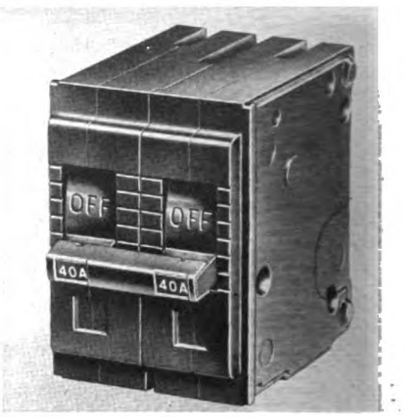
Name ..... **Title or Position** .....

Company .....

Address .....

City ..... **Zone** ..... **State** .....

break down under the movement of the car. Excellent adhesion to wood, steel and aluminum is claimed; the film can not be stripped from a surface after application. Railroad Cocoon is a system of various vinyl resins and low-temperature plasticizers. It is colored white with titanium dioxide pigment to emphasize cleanliness and enable the sprayer to see the areas he has covered. The pigment chosen for the coating, which is supplied in five and 50-gal. containers, is one that will not react with the commodities shipped. It is manufactured by R. M. Hollingshead Corporation and is distributed by *Brandon Equipment Company, 332 S. Michigan avenue, Chicago.*



Circuit Breaker

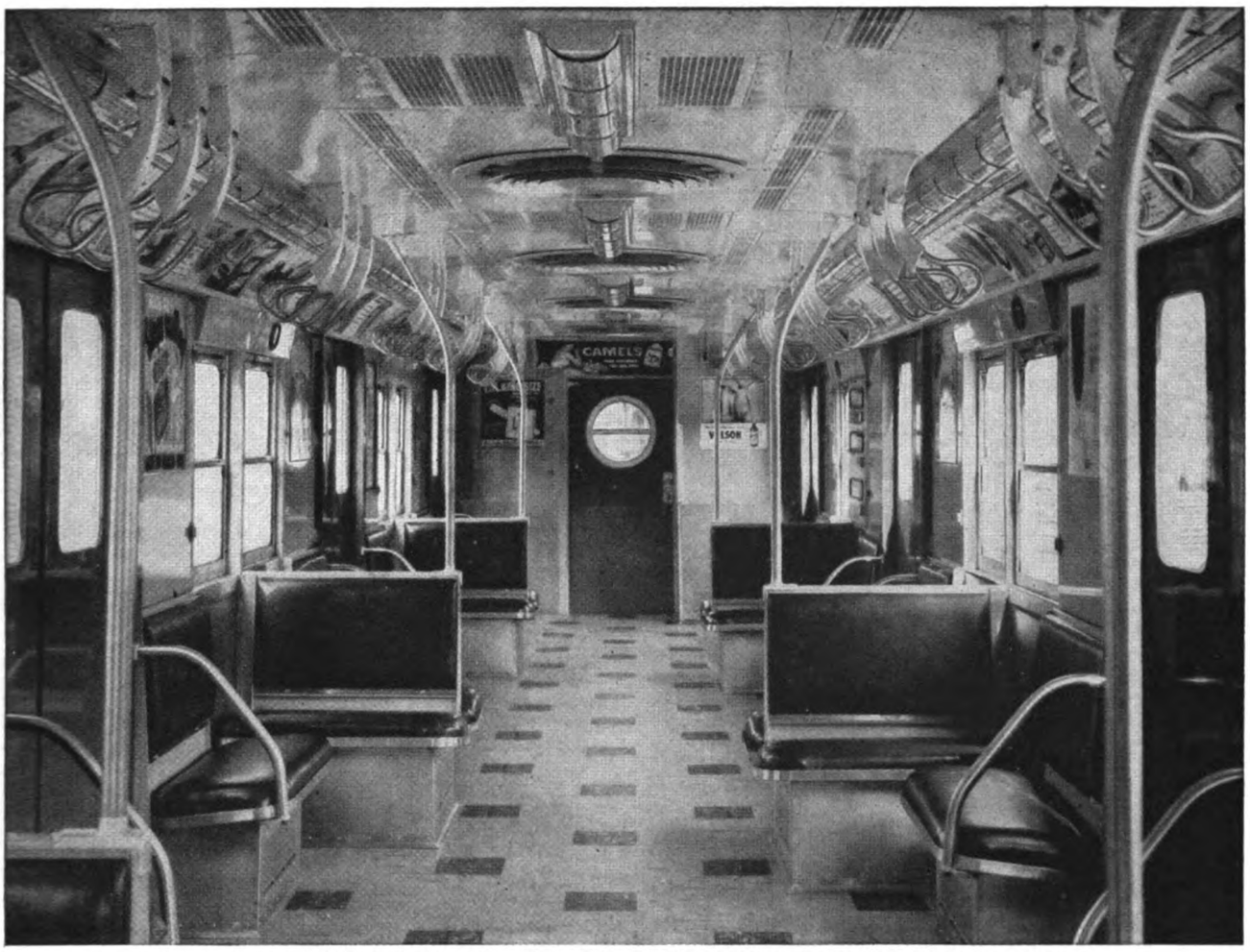
This two-pole common-trip circuit breaker, Type TQL, is for use in panel boards and load centers. It was designed to give protection for equipment and personnel wherever two-pole common-trip breakers are required and, according to the manufacturer, should meet all construction code requirements. Excessive current in either pole of the breaker opens both poles at the same time because of the interlocking trip mechanism.

Thermal and independent magnetic trip elements provide protection against both short circuits and sustained overloads. Momentary overloads, such as motor starting, will not trip the breaker. The breaker will trip even if the handle is held in against a circuit fault.

Installation is simplified because of the plug-in construction and the straight-in wiring to terminal connections. This is a 2-in. breaker and will fit panel boards designed for 1-in. models. The TQL is available in six ratings from 10 to 50 amps for 120/240 volt a-c operation. *General Electric Company, Plainville, Conn.*

Synthetic Cutting Fluid

Dromus Oil E, a synthetic compound, is mixed with water to make a cutting solution for use in all type of machine tools. It does not have the petroleum base of



These New Cars, fabricated largely of nickel alloy steels, accelerate at twice the rate of the old, and provide 50% greater deceleration. Controls and safety devices are powered by a 24-cell Edison "B4H" nickel-iron-alkaline storage battery. ACF Industries, Inc., New York 8, N. Y., built this modern type car for New York City Transit Authority.

4,766,019 passengers daily

...so New York City Transit Authority turns to Nickel Alloys

TAKING CARE of such a tremendous traffic load, naturally, puts a strain on equipment. Each car must be built for maximum safety, and for annual wear and tear from hundreds of thousands of passengers, and innumerable starts and stops.

New York City Transit Authority's answer is a new type of car that makes wide use of nickel alloys. Alloys that cut maintenance. And power costs, too, in a car that's lighter and brighter than the city has ever before seen.

The builder, ACF Industries, Inc., used truck frames and bolsters of 2½% nickel steel. High strength, low alloy steels containing nickel are utilized for car and underframing. During years of use, this type of wrought nickel steel keeps much of its original strength. Because it's five times as corrosion-resistant as carbon steel.

Each car also uses some 2500 pounds of rigidized stainless steel, Type 302. In underseat paneling and beneath windows, this chromium-nickel alloy adds strength, cuts weight, resists scuffling, and needs no paint. Seat frames, backing, hand poles and hand straps are likewise, Type 302, a labor-saving chromium-nickel stainless steel.

Alloys containing nickel cut bulk and dead-weight, minimize wear and corrosion, add beauty and safety. So let us help you with our wide experience. Write for List A of available publications. It includes a simple form that makes it easy for you to outline your problem.

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

Lewis sealtite car bolts

More than 85% of America's Class I railroads use Lewis Sealtite products. Designed to do a better job . . . to last longer . . . to meet the most exacting specifications. Specify Hot Dip Galvanized, Zinc finish for Double-Life and economy. All products are manufactured in the U.S.A. to A.S.T.M. specifications.

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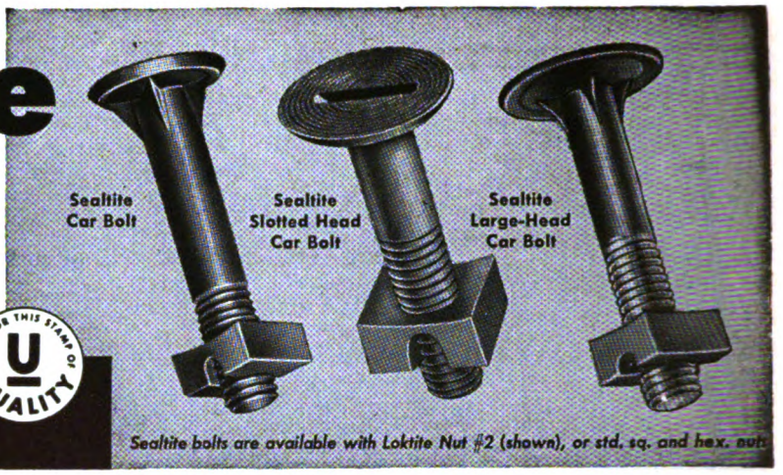
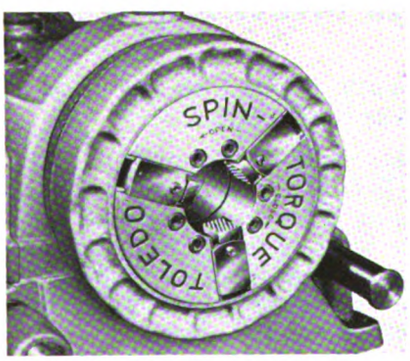


most cutting fluids, and dissolves in water, forming a true solution and not an emulsion. There will be no separation even if the fluid stands for long intervals. Exceptional cooling properties are claimed for the oil when mixed with water, and it can be combined with a very large volume of water to take advantage of the water's high cooling effect.

Oil E is said to resist the rusting of equipment and improve the wetting character of the solution to reduce friction between tool and chip. The mixed solution is almost clear and does not leave any oily or greasy deposit when splashed on clothing. It does not froth, foam, or form hard-to-clean sludge. Chips and grinding grits settle out rapidly so that they are not recirculated through the pump and cooling system. For lathes and other such machines, a mixture of 30 parts of water to one of Dromus Oil E is recommended. Grinding is done with a mixture of 70 to one. *Shell Oil Company, 50 W. 50th street, New York 20.*



Chuck

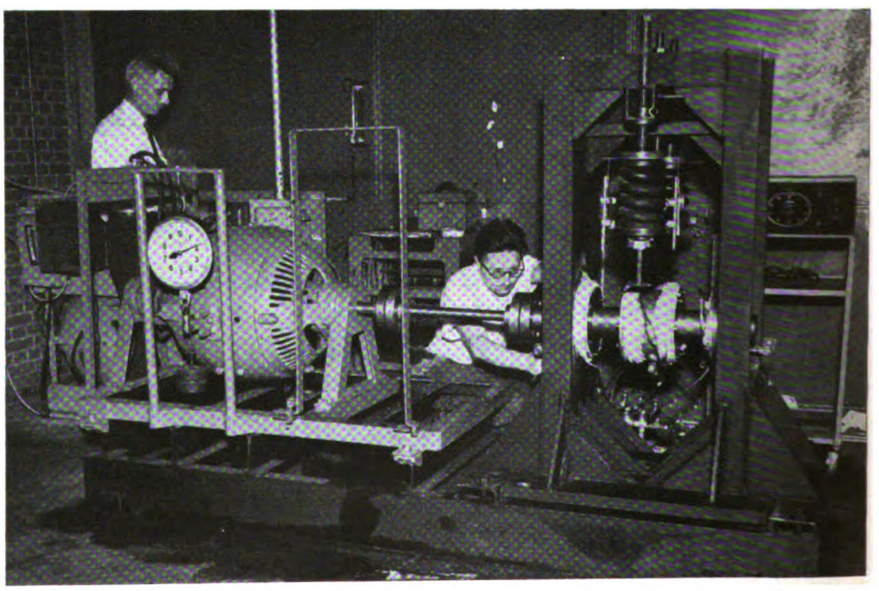
Rocking-wedge jaws which tighten as torque is applied are a feature of the Spin-Torque chuck. A spin of the large hand wheel closes the jaws quickly and smoothly. The jaws pull up tight under normal hand pressure and no hammering is necessary. Diagonal serrations on the jaws eliminate end-thrust slippage and permit rotation in either direction. The jaws are set flush with the face of the chuck to prevent injuries and to enable threading up to the face.

The chuck is said to combine strength with light weight. It clamps rod or bolt stock from ¼-in. up, and pipe or conduit from ⅛-in. to 2-in. A special interlock feature of the jaws makes this range possible. *Toledo Pipe Threading Machine Company, 1445 Summit street, Toledo 4, Ohio.*

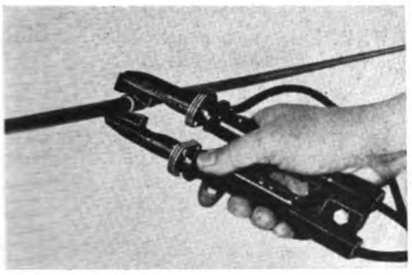
Ultra Sensitive Current Meter

The TAKK Ultra Sensitive current meter is suitable for measurement of very small leakage currents through insulation at any voltage level. It makes possible measurement of d-c currents from 0.001 to 1000 microamperes with an accuracy previously obtained only with the delicate mirror-type suspension galvanometer. With a multiplier resistor, the meter can be used as a very high resistance voltmeter. Resistance measurements up to 150,000,000 megohms can also be taken when used with a suitable voltage source. Electrolysis analyses can be made.

The meter was designed for use with the TAKK high voltage d-c insulation test sets but can be used with any high voltage d-c power supply. The meter is 9 x 6 x 5½-in., is ruggedly built, and weighs 8 lb. Its accuracy is claimed to be within plus or minus four per cent when measuring leakage currents. *Hewson Company, 443 Broad street, Newark 2, N. J.*

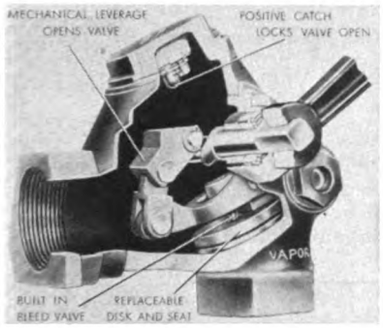


A SIGNIFICANT REDUCTION in occurrence of hot boxes may result from a $275,000 research study recently completed by Armour Research Foundation of Illinois Institute of Technology, at Chicago. Here, two foundation engineers operate a special experimental assembly devised for the hot-box project to study freight car journal bearings. Possible causes of bearing failure due to load, speed, and the condition of the lubrication used were observed during the investigation.



Pliers Soldering Tool

The soldering of copper tubing, and the soldering of heavy wire and cable in repair and installation work can be done with this 1000-watt all-electric soldering tool. It is equipped with 10-ft leads and the heat control is a push button in the pliers handle. It is claimed that the tool will solder sweat fittings up to 1¼-in. size. *Wassco Electric Products Corporation, Joliet, Ill.*



Easy-Closing Steam Line Valve

A steam end valve has been designed with an easy-opening feature for passenger cars and diesel locomotives to control high-pressure train line steam.

A mechanical linkage inside the valve multiplies the lever pressure for opening against the 250-lb steam pressure that can be in the line. The valve opens slowly at first, to crack it open, then increasingly faster to a full open position. The stem rotates approximately 103 deg from closed to full open.

A positive stainless steel spring-catch locks the valve in the open position so that it doesn't vibrate closed during a trip and shut off the steam. The button on the spring catch fits into the groove on the horizontal surface in the illustration. The pressure of the spring prevents road shock from moving the linkage, and hence closing the valve. At the same time, the groove is of a small enough angle that a moderate pressure on the handle can close the valve when this is desired.

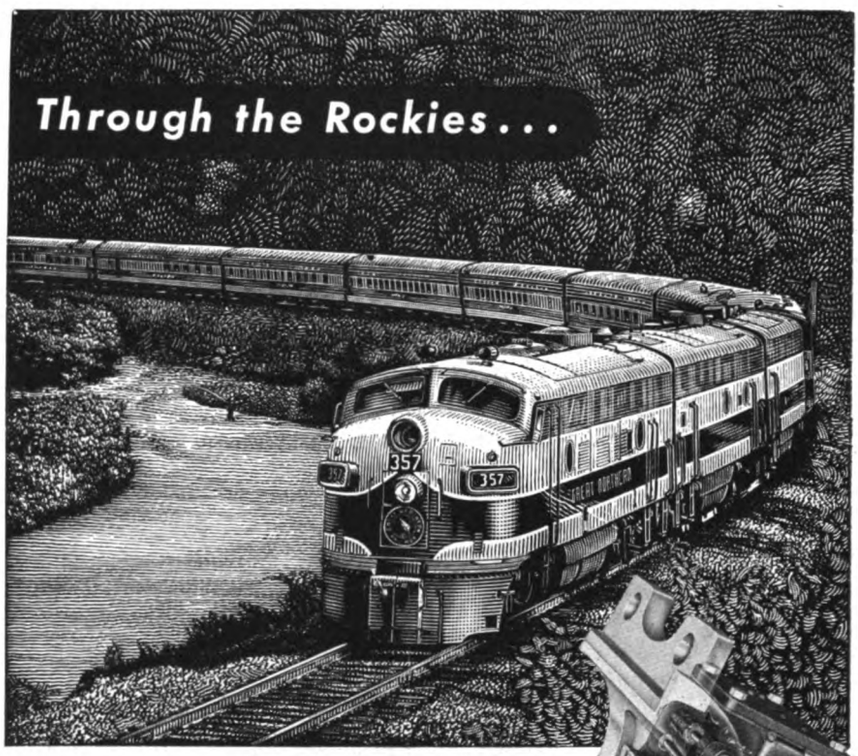
The replaceable disc and the replaceable seat are made of stainless steel, with the former heat-treated. A bleed valve—also stainless steel—is built right into the disc. The bleed valve allows the small amount of steam to bleed out of the end of the last car in the train which is necessary for proper functioning of the steam heating system. A spring loaded packing on the stem automatically compensates for wear without adjustment.

There is also a kit of the interior parts of this new end valve that can be installed in older 2½ in. end valve bodies which will give the rebuilt valves the advantages of the new, easier-to-open valve. *The Vapor Heating Corporation, 80 East Jackson, Chicago 4.*

Solvent

Turco-Solv, designed primarily for the cleaning of electrical equipment, is composed of solvents of low toxicity. It contains neither carbon tetrachloride nor any of the chlorinated solvents, and is said to be non-explosive and non-flammable.

The manufacturer states that Turco-Solv effectively removes grease, oil and carbon film from brush holders, insulators, commutators, string bands and coils of motors and generators. It evaporates quickly and is non-conductive, which may permit the cleaning of hot equipment. When dry, there is no residue to loosen insulating paint, or pick up carbon dust and metallic particles. No after-neutralization is required. In addition to electrical cleaning, Turco-Solv can be used for mechanical cleaning jobs. *Turco Products, Inc., 6135 South Central avenue, Los Angeles 1.*



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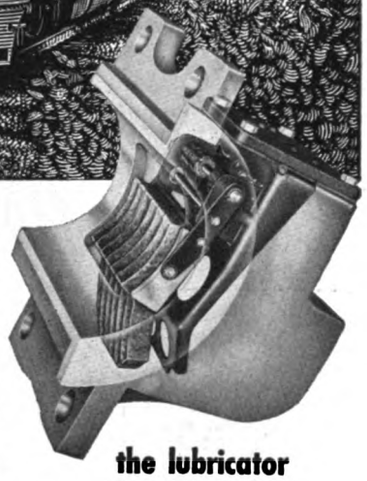

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Built to give long service where conditions are especially rough on hose lines. Reinforced with high tensile strength wire braid with outer cover of tough synthetic rubber. In bulk Hose or Hose Assemblies with Stratoflex "over the cover" detachable, re-usable fittings. Write for your FREE catalog or order through your dealer.

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PERSONAL MENTION

(Continued from page 9)

Pennsylvania

Eastern Region

J. M. McGUIGAN, assistant engineer of motive power, office of electrical engineer, Philadelphia, appointed assistant master mechanic, Philadelphia division.

Western Region

STEPHEN NAGY, general car inspector at Chicago, appointed chief car inspector, office of general superintendent of motive power.

J. E. KEEGAN, chief car inspector, office of general superintendent of motive power, retired.

Seaboard Air Line

W. R. LAWRENCE, appointed supervising electrician, at Raleigh, N. C.

Southern

FRANK E. STUBBS, appointed superintendent motor shop, Atlanta, Ga. Formerly assistant diesel superintendent, Washington, D. C.

Waterloo, Cedar Falls & Northern

W. G. LAMB, master mechanic at Waterloo, Iowa, retired.

H. L. CALLIES, shop foreman, appointed master mechanic at Waterloo, Iowa.

Obituary

O. F. HARK, assistant general superintendent motive power—personnel, died on Monday, May 30.

SUPPLY TRADE NOTES . . . . . .

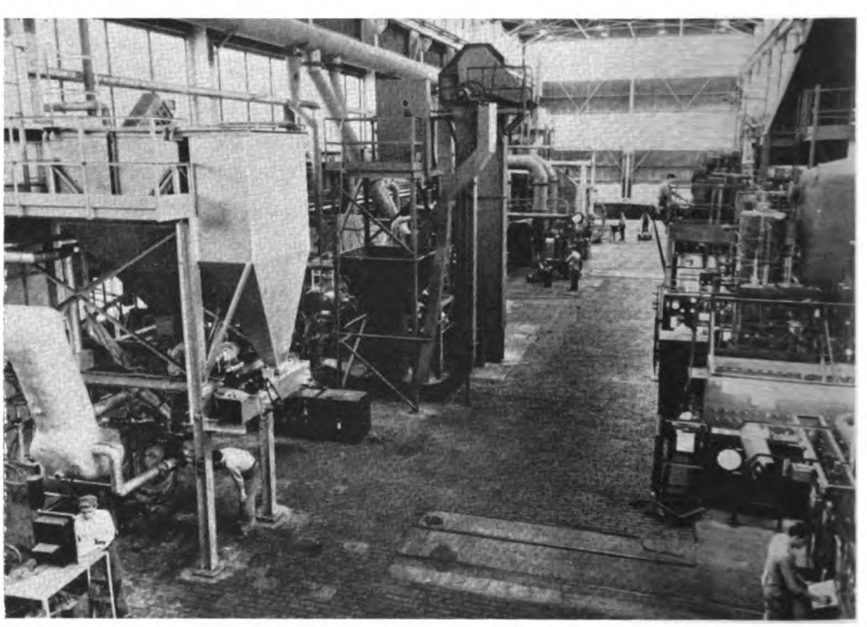
SAFETY CAR HEATING & LIGHTING CO.—Safety has acquired the *Automatic Temperature Control Company*. ATC will continue operations at Philadelphia as a wholly owned subsidiary of Safety.

■

GREAT LAKES STEEL CORPORATION.—*Harry D. Fenske* has resigned as vice-president—transportation and general manager, Steel Floor division. Mr. Fenske, the inventor of Nailable Steel flooring, had been in charge of its promotion and sale.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*Chris H. Barlett*, manager of the manufacturing and repair division, has been elected vice-president in charge of that division, at Pittsburgh.



The Babcock & Wilcox Company, builder of the boiler for the Norfolk & Western's steam turbine-electric locomotive, "Jawn Henry," is conducting investigations in power production and allied fields at its research center, Alliance, Ohio. Both high pressure water-cooled and liquid-cooled atomic reactor systems are under study, and a new gasketed closure for atomic pressure vessels to replace the solid welds now used to prevent radioactive leakage is under development. Other important B&W research activities include developments of high-temperature and high-pressure alloys, submerged arc welding at speeds five times as fast as comparable welding methods, steam generators operating at above-critical pressures and temperatures, 4,500 psi and 1,150 deg F, respectively, and investigations in the burning of low-grade fuels. Illustrated is the part of the research center where pilot power plants are operating under simulated service conditions.

D. R. Carse

Douglas Grymes, Jr.

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*D. R. Carse*, assistant vice-president, has been elected vice-president, sales. Mr. Carse will continue in charge of the New York office.

■

ALAN WOOD STEEL COMPANY.—*Harleston R. Wood* has been elected president and chief executive officer, effective August 1, succeeding *John T. Whiting*. Mr. Wood was previously vice-president in charge of planning and development.

■

UNION CARBIDE & CARBON CORP., ELECTRO METALLURGICAL COMPANY. — *Arthur R. Lytle* has been appointed vice-president in charge of research.

■

WESTINGHOUSE ELECTRIC CORPORATION.—*Chris H. Bartlett*, has been elected vice-president in charge of manufacturing and repair division at Pittsburgh. *Charles C. Shutt*, head of small motor division at Lima, Ohio, also elected a vice-president.

■

KERITE COMPANY. — Kerite has appointed *Robert A. Young* as Pacific coast manager, to supervise its sales and engineering in that territory. Mr. Young will continue to operate his own established business in electrical power sales and engineering on the West Coast.

■

NATIONAL PNEUMATIC COMPANY, HOLZER-CABOT DIVISIONS. — *Richard H. Frost* and *J. J. Anderson* have been appointed president and vice-president and general sales manager, respectively, of National Pneumatic and Holzer-Cabot.

■

CUMMINS ENGINE COMPANY.—*Paul J. Every* has been named assistant general sales manager.

■

INTERNATIONAL NICKEL COMPANY. —*M. D. Belware* has become a member of the Welding Group of the Development and Research Division's Technical Service Section. *Eugene H. Kinelski* and *Leon M. Petryck* have been apointed research metallurgists in the Welding Section of the Research Laboratory at Bayonne, N. J.

KOPPERS COMPANY, WOOD PRESERVING DIVISION.—*Douglas Grymes, Jr.*, has been appointed a vice-president. Mr. Grymes will retain the duties of division sales manager, which he assumed in 1953.

■

VANADIUM CORPORATION OF AMERICA.—*John J. Green*, formerly with Universal-Cyclops Steel Corporation, has been appointed service engineer in the Pittsburgh office of Vanadium.

THE BUDD COMPANY, on July 1, will assume ownership and management of a wholly owned subsidiary company: Continental-Diamond Fibre Division of The Budd Company, Inc. The new subsidiary was created by the purchase of plants from the Continental-Diamond Fibre Company at Newark, Del.; Bridgeport, Pa.; Valparaiso, Ind., and Spartanburg, S. C., and subsidiaries in Canada and France. These plants are engaged in the production of laminated plastics for industrial use and insulating tapes. Included is a full line of railway track insulation. The name of the old Continental-Diamond Fibre Company will be changed to the Haveg Company which will continue to own and operate a plant at Marshallton, Del., and a British subsidiary, engaged in the manufacture of plastics used in the chemical industry.

■

BALDWIN-LIMA-HAMILTON CORPORATION. — *McClure Kelley* has been elected president, succeeding *Marvin W. Smith* who continues as an executive officer of the company, with special duties and responsibilities. *Robert G. Tabors* and *Arthur Clements* have been elected vice-presidents of the Hamilton (Ohio) division.

■

BRODERICK & BASCOM ROPE CO.—*Joseph H. Bascom*, executive vice-president and treasurer, has been elected president, succeeding *C. E. Bascom*, elected chairman of the board.

FIRST TRULY PORTABLE 200 AMP. ARC WELDER

Weighs only 65 lbs.; carry it to the job!
Using the first TOROIDAL transformer!

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OBSOLETES ALL OTHER WELDERS OF COMPARABLE RATING!

Employing the first toroidal transformer ever used in arc welders, the portable Bren-Weld does the work of conventional welders 4 to 5 times its size and weight. Eliminates the necessity to transport bulky equipment or heavy parts to be welded. *Now you can carry Bren-Weld to the job!*

Bren-Weld handles electrodes from 3/64" through 5/32"; it has adjustable arc voltage for various arc characteristics.

Because it is so flexible in operation and application, Bren-Weld is ideal for plant production and maintenance, for construction work, for railroads, on the farm and in home workshop.

24 HOUR DELIVERY FROM STOCK!

- 200 Amp.—At 50% Duty Cycle
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- Simple To Use—Fully Guaranteed

11" x 12" x 7½"
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This cost, of course, varies greatly on different railroads. But it can be greatly minimized by the proper choice of a traction brush grade.

Stackpole Carbon Company diesel traction brush engineering is aimed first of all at good commutation and stable filming qualities under the most adverse conditions. Records of many users prove the ability of Stackpole brushes to keep commutators in service for exceptionally long periods. *In some particularly difficult types of service, Stackpole brushes have actually improved poor commutator conditions that developed when other makes of brushes were used.* The records show that this has been accomplished with entirely adequate brush life.

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STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

S. M. Felton

ACF INDUSTRIES, INC., AMERICAN CAR & FOUNDRY DIVISION.—*Samuel M. Felton* has been appointed president.

Mr. Felton, who has been president of the Shippers' Car Line Corporation, an ACF subsidiary, since October 1950, was president of the American Railway Car Institute for five years prior to joining ACF. For ten years he was general sales manager of the Railway Division of the Budd Co.

■

J. A. ZELLE COMPANY.—The Zelle Company, Bridgeport, Conn., has acquired the railway assets of the *Barnaby Manufacturing Company*, including dies, tools, patterns, drawings and inventory.

■

ELECTRIC STORAGE BATTERY COMPANY.—*Edward A. Holland*, industrial sales engineer, has been appointed assistant manager New York sales branch.

■

U.S. INDUSTRIES, INC., AXELSON MANUFACTURING COMPANY DIVISION.—*Edward D. Jackson* has been appointed general sales manager, with headquarters in Los Angeles.

■

AMERICAN BRAKE SHOE COMPANY.—American Brake Shoe has purchased the *Denison Engineering Company*, Columbus, Ohio, manufacturers of hydraulic presses, pumps, and automatic controls. The company will continue to operate under its own name, with *W. C. Denison* continuing as president and chief executive officer.

■

CRANE COMPANY.—*Frank F. Elliott*, senior vice-president of sales, has been elected president and chief executive officer, succeeding John L. Holloway, who has resigned because of ill health.

■

C & D BATTERIES, INC.—Operations have begun at the new C & D plant at Attica, Ind.

■

INTERNATIONAL EQUIPMENT COMPANY.—*H. W. Wreford* has been assigned full charge of Ontario operations, with jurisdiction over sales, service and administration of Toronto and Hamilton branches.

■

NEW YORK AIR BRAKE COMPANY.—*Edward D. Higgins*, has been appointed assistant to director of engineering. He was formerly with Eclipse Pioneer division, Bendix Aviation.

(STN's continued on page 95)

F. U. Hayes

H. E. Neale

Dr. J. E. Stareck

H. D. McLeese

BULLARD COMPANY.—*Frank U. Hayes*, a vice-president, has been appointed assistant general manager, and *H. Edward Neale* has been appointed sales manager.

Mr. Hayes was appointed sales manager in July 1947 and elected a vice-president in March 1951.

Mr. Neale was assigned to the sales department, New York State in 1947; to the Chicago territory in 1949, and in 1951 was appointed assistant sales manager.

■

KOPP GLASS, INC.—*Willard A. Provost*, eastern sales manager, has been appointed assistant sales manager, at Swissvale, Pa.

METAL & THERMIT CORPORATION.—*Dr. J. E. Stareck* appointed director of research, continuing also to direct research activities of United Chromium, Inc., a subsidiary. *H. D. McLeese* has been appointed general sales manager, directing sales also of United Chromium, of which he has been vice-president and general sales manager.

■

WORTHINGTON CORPORATION.—*Hellmuth Walter* has been appointed director of research at Harrison, N. J., succeeding *Ralph M. Watson*, resigned. *Robert S. Sherwood* has been appointed assistant director of research.

The Plainfield, N. J., (Welding Equipment Division) of Worthington has been appointed exclusive national distributors for the line of welding controls manufactured by the Mullenbach Division of the *Electric Machinery Manufacturing Company*, which are now known as Worthington-Mullenbach controls.

■

Obituary

ROBERT JAY SHOEMAKER, engineering consultant, Magnus Metal Division, National Lead Company, Chicago, died on Wednesday, May 25.

■

GUSTAF A. LILLIEQVIST, research director for American Steel Foundries, Chicago, died suddenly on May 31.

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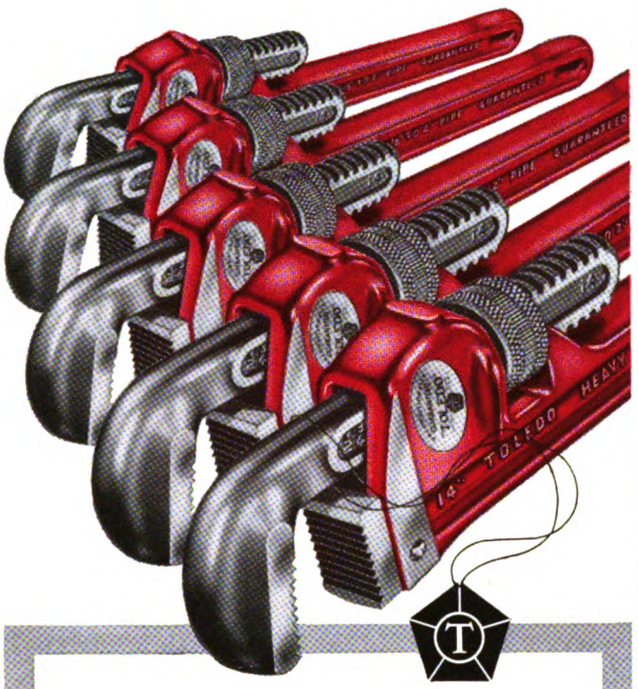

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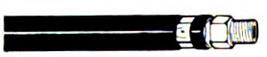
with PUNCH-LOK Hose Clamps



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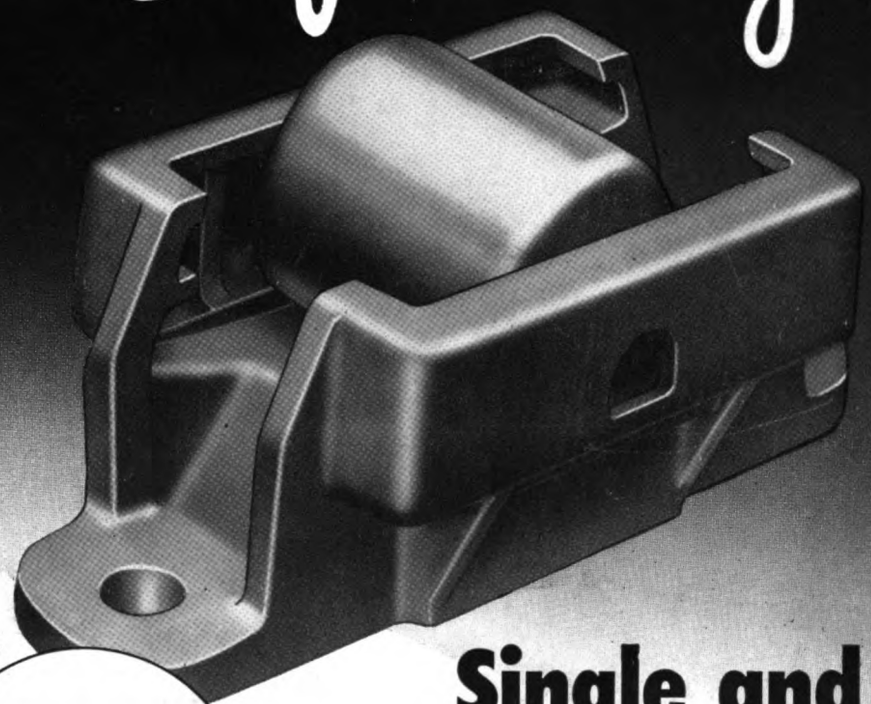

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SIDE BEARINGS

Sturdy.. with Ample Capacity

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HOW MANY STEPS IN THE LIFE OF A BRAKE BEAM?

The railroads use millions of time-consuming, money-wasting steps each year carrying freight car brake beams into reclamation plants for dismantling and reassembling—then back again to the stores department.

Truslock cuts the number of those steps right in half!

Here's why—

Worn or damaged brake heads account for at least half of the brake beams coming into reclamation plants. It stands to reason that a brake beam equipped with a quick-change brake head—replaceable in a jiffy without special tools or the need to disassemble the brake beam—will cut your reclamation costs by fifty percent.

Economical maintenance is only one of the many TRUSLOCK features that have sold this premium brake beam to 7[illegible] railroads and private car lines.

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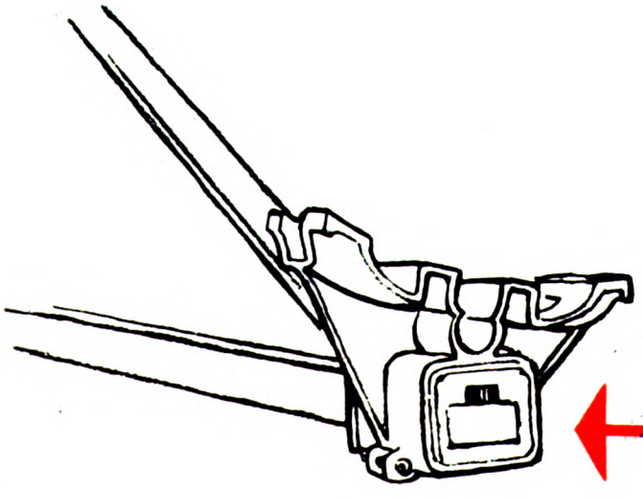

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

AUGUST, 1955 **VOLUME 129, NO. 8**

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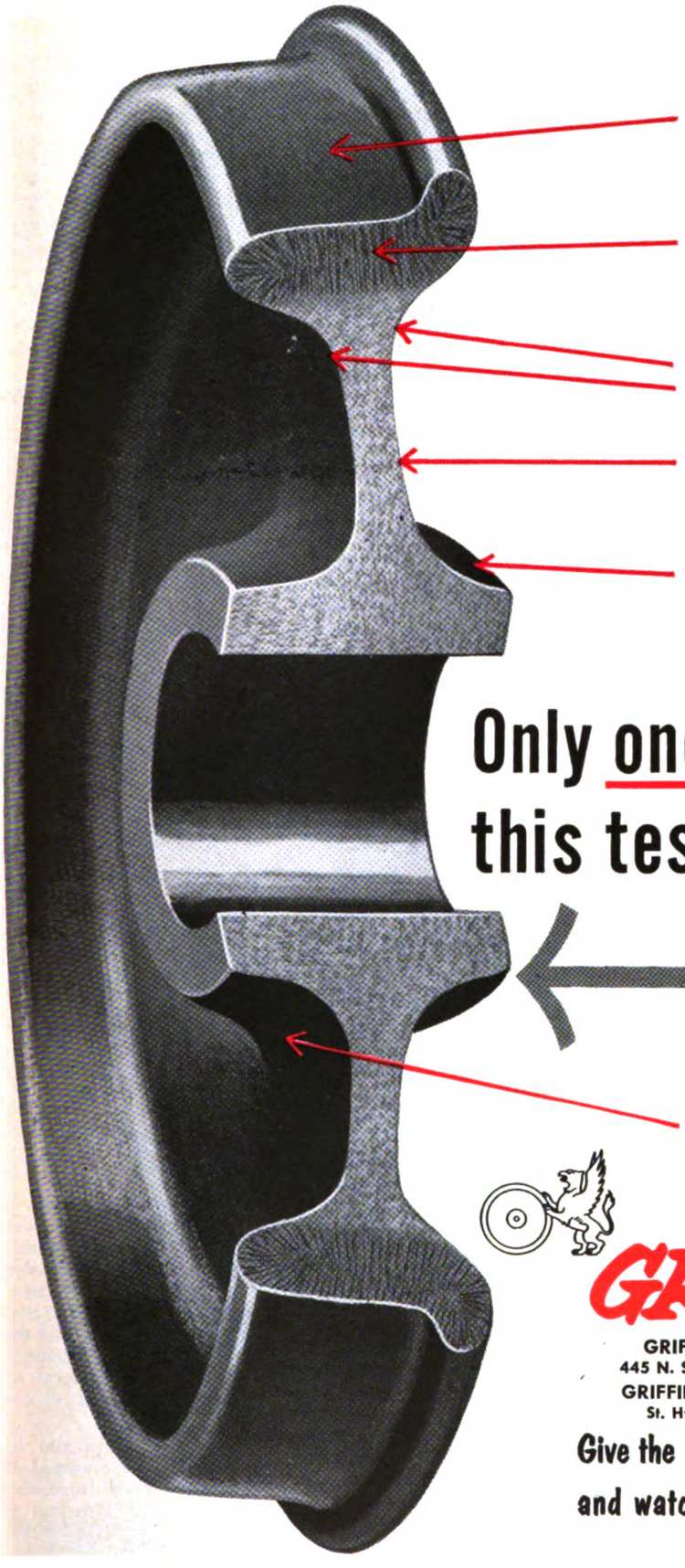

Roundness of EQS wheel is practically perfect—as-cast. No machining necessary . . . the toughest and longest-wearing metal is *on the tread, NOT in the scrap bin.*

Pressure pouring in graphite molds results in superior flange and tread wear. Note the directional solidification in flange and tread, shown before heat treatment: *the grain of the metal in EQS wheels is at right angles to the point of wear.*

Long sweeping fillets under flange and rim of EQS wheels insure greatest possible strength.

The Griffin EQS plate is of *uniform thickness*, dimensionally accurate in any section.

Now made of .75 carbon steel. Exclusive casting process used in producing EQS wheels permits use of recognized steel analysis that will best meet your requirements.

Only one wheel can pass this test with a score of 100

Location of hub and plate is identical in all EQS wheels; dissipation of heat is even, without developing internal stress.

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ELECTRIC QUALITY STEEL

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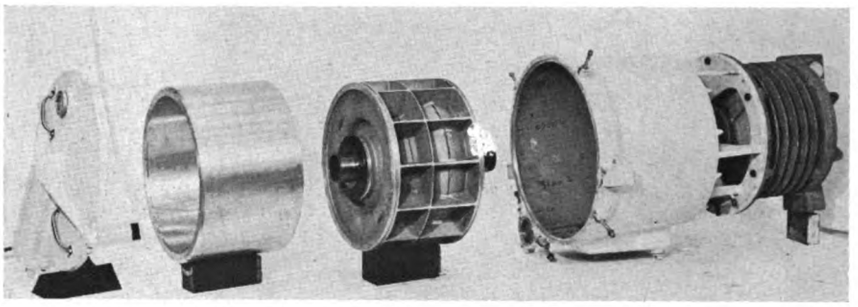
GRIFFIN STEEL FOUNDRIES LTD.
St. Hyacinthe, Quebec, Canada

Give the "green" to GRIFFIN...
and watch your costs go down!



Seprifuge components (from left to right) are the cover, rotor shell, impeller, housing and electric motor. EMD has a hand-truck mounted impeller cleaner especially designed for servicing the Seprifuge. With the system, cost of replaceable filters is eliminated and it is said that the Seprifuge will operate up to two months without attention.

Seprifuge Spin Cleans Lube Oil

Diesel engine lube oil can now be kept clean mechanically with a new development by Electro-Motive. This development, the Seprifuge, has a feature new to diesel locomotive operation in this country—it cleans all the oil delivered to the engine and does this by centrifugal action.

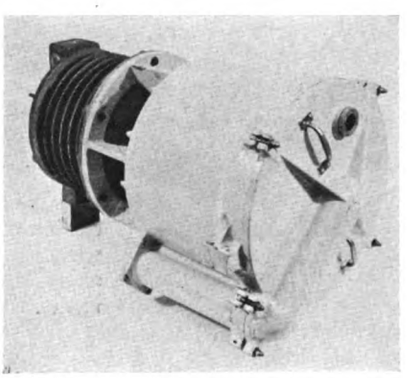
The Seprifuge is located between the scavenging pump and the lube oil delivery to the engine. The oil is cleaned before going through the cooler. The Seprifuge is installed in the space occupied by the lube-oil filter housing on EMD locomotives. Rotative speed varies from 1,140 rpm when the engine is idling to 3,245 rpm at full engine speed. The amounts of oil cleaned at these speeds are 80 and 265 gpm respectively, or all the oil delivered at any engine speed. Pressure drop through it is 8 psi.

The centrifugal cleaner is powered by the locomotive a-c system rated at 149 volts at 106 cycles for full engine speed, and is currently adaptable only to GM power with a-c auxiliaries. However, there is under development a turbine-driven Seprifuge which will utilize part of the fluid energy from the lube oil scavenging pump to drive a turbine which will spin the cleaner. This will enable it to be applied to GM power without a-c current and to competitive engines.

Prior to the development of the Seprifuge, centrifugal oil cleaners were not considered practicable for locomotive application because the largest capacity commercially available was about 30 gpm and was several times as big as the Seprifuge's overall length of 40 in. and diameter of 24 in.

The Seprifuge removes all dirt and other impurities that a filter can remove with the exception of small amounts of amorphous (blow-by) carbon, e.g. the carbon formed by the burning of the fuel. Electro-Motive feels, however, that this carbon does no harm in the lube oil because the detergent keeps it in very finely divided suspension. The principal effect is that the oil will be darker because it will contain an average of 0.1 to 0.2 per cent carbon.

While the Seprifuge develops 2100 G's (2100 times the force of gravity) at the mean radius of the separation port at maximum speed, it does not remove additives from the oil. The cleaning process depends entirely upon the centrifugal force. It separates the impurities from the oil by means of the differences in the specific gravities, and the additives have very nearly the same specific gravity as the lube oil with which they are blended.



Assembled for application to the locomotive, the Seprifuge is 6 in. shorter than the lube oil filter housing it replaces on the locomotive, and fits into the same space on the equipment rack. Powered with an electric motor driven by the a-c system of the General Motors locomotives, speed of the Seprifuge impeller increases as engine speed rises.

Impurities removed from the oil are precipitated out along the inner circumference of the casing. They stick there because the resins that result from the natural breakdown of the oil during operation combine with these impurities to form a sludge of about the consistency of road tar. This mixture, by sticking in the sludge chambers, prevents the dirt and other impurities from returning to the oil stream or contacting it in any way even when the Seprifuge is not running. The sludge chambers hold 1100 cu in.

Uses other than cleaning diesel engine lube oil are foreseen by Electro-Motive. The principal limitation on what the present production Seprifuge can handle is that the fluid to be cleaned must be suitable as a lubricant for its bearings. It could therefore handle such items as diesel fuel or machine tool cutting oil. As a matter of fact, a small model, 30 gpm with a 500 cu in. collection chamber and driven by a 1-hp motor, is under development for this latter purpose. The locomotive model is driven by a 5-hp motor, although its peak requirement is 3.8 hp.

General Motors became interested in the concept of a full flow filter to explore the possibility of preventing the beginning of what may be termed the chain reaction of wear. In this chain reaction a few particles in the oil cause wear in some part of the engine. This wear in turn generates more particles which cause more wear. In line with this thinking, EMD is using the Seprifuge on all new engines to remove foreign material during the break-in running at the plant.

One of the early tests to evaluate the Seprifuge was made on a truck engine and compared the rates of wear on different parts for four possible conditions—no filter, by-pass filter, full flow filter and the Seprifuge. As part of this test a check was made to determine the largest size particle that might ordinarily be found in an engine equipped with the Seprifuge. This was 5 microns (2 to 3 tenths of a thousandth of an inch).

Approximately, 1¼ million miles of test service has been accumulated on the Seprifuge. Currently 14 tests are now running on 12 different railroads, with most of the installations in freight service on dual purpose units.

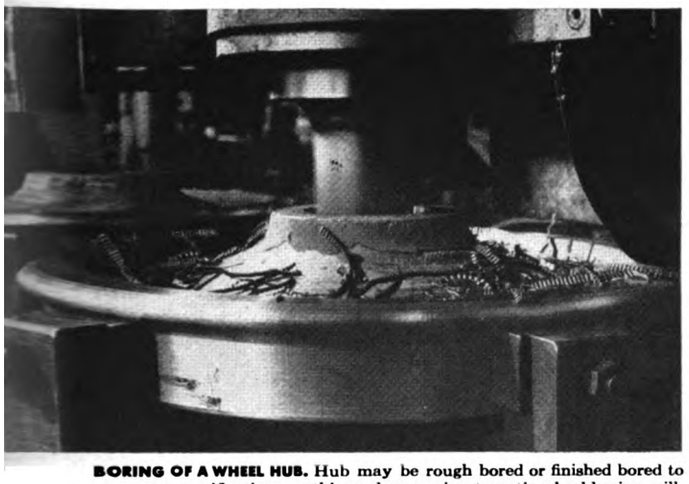
Typical of the tests using detergent oil was once conducted on an F-7 unit. When the centrifugal cleaner was installed, the air box was cleaned and the cylinder liners were found to have the intake ports about half plugged with carbon on the outboard side and almost completely plugged on the inboard side. Two of the power assemblies were replaced with all new parts to measure the wear.

After a little over a half year and 130,000 miles of test service, the two replaced assemblies had carbon deposits between 1/16-in. and 1/8-in. thick. The remaining liners appeared to have about the same amount of deposit as they did at the start of the test. Actually, they probably picked up an 1/8 in. or so, but this slight increase was not visibly apparent with the intake ports already over half plugged.

The Seprifuge was also tested on a locomotive using straight mineral oil. This test showed a high rate of dirt accumulation by the cleaner which EMD feels was due to the faster rate of breakdown of straight mineral oil over additive-type oil. The general result of the test also showed that the Seprifuge can be used with straight mineral oil, but that the use of the mineral oil requires more frequent cleaning of the dirt chambers.

Parallel tests have also been run on three railroads. These tests consisted of running a Seprifuge-equipped locomotive under operating conditions identical to

(Continued on page 110)



BORING OF A WHEEL HUB. Hub may be rough bored or finished bored to customer specifications on this modern semi-automatic wheel boring mill.

KNOCKOUT!

ONE POWERFUL THRUST **of this giant punch and the center of a wheel hub is literally knocked out—a very important step in the forging of USS *Wrought* Steel Wheels.**

During the production of a wheel block, the metal is worked in a direction parallel to the axis of the original ingot—a process which ultimately leaves the zone of ingot segregation in the center of the wheel hub. But the relentless punch press takes care of that—and the unwanted zone of segregation goes clattering into the waste pit.

This rolling process, plus the subsequent rolling operation which works the metal in a direction *transverse* to the axis of the ingot, imparts the best metallurgical properties to the finished wheel. All the careful forging, rolling, and controlled-cooling undergone by a USS *Wrought* Steel Wheel serve to intensify the inherent strength, hardness, and ductility of the steel—resulting in a wheel of remarkable soundness and dependability.

But what does the Wrought Steel Wheel do for you?

IT LASTS LONGER . . . USS One-Wear *Wrought* Steel Wheels will average 200,000 to 300,000 miles or more in normal freight car service.

IT COSTS LESS . . . Its far greater life in any given service will reflect a *substantially lower annual cost* than that of the ordinary wheel, even though, initially, the One-Wear *Wrought* Steel Wheel costs a little more than the ordinary type wheel.

REQUIRES LESS MAINTENANCE . . . Rolling on One-Wear *Wrought* Steel Wheels, a car spends more time *in service* and less time on repair sidings, resulting in increased revenue to the railroad. Also, less frequent repair means reduced maintenance and lower labor costs.

SAVES UNSPRUNG WEIGHT . . . Because they are lighter than ordinary wheels, eight *Wrought* Steel Wheels under a 50-ton capacity car will save approximately 1,520 lbs. of unsprung weight, which can be directly converted into payload capacity—or result in savings due to the decreased load. Furthermore, reduced unsprung weight means less pounding on the track system.

Two strategically located complete wheel shops are ready to fill your orders for *Wrought* Steel Wheels: McKees Rocks (Pittsburgh), Pennsylvania shop, serving the East and Southeast, and the Gary, Indiana shop, supplying the Western and Southern Lines.

USS WROUGHT STEEL WHEELS

UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

USS TRADE MARK

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

NEWS. . . . . .

Rising Diesel Maintenance Costs

An increase of 19 per cent per year in repair costs of diesel-electric locomotives is indicated in a statement made by J. M. Symes, president, Pennsylvania, in speaking recently before the I.C.C. on the Ex Parte 175 rate case.

Mr. Symes said in part: "The railroads as a whole, including the Pennsylvania, benefited greater after World War II through the economies in dieselization. However, the economies that have been obtained to date cannot be maintained in the future. As time goes on and mileage is accumulated, repair costs go up. We have been taking a great deal out of these diesel locomotives, but have been putting back very little, thus far. Eventually this will catch up with us. The trend is already there. In 1948, our repair cost per diesel unit mile was 13.46¢. In the next year, it was 18.90¢. In 1952, it was 25.31¢. In 1953, 25.93¢, and in 1954, 28.87¢. The increase was 114 per cent in 6 years. Equating the figures to the 1951 dollar value, we find that with an average age of only 4.3 years, the diesels have reached an average repair cost of 27.76¢ per unit mile—practically the same as for our electric locomotives in 1940 when their average age was 8.3 years. That clearly reflects the fact that the diesel locomotive, with its vastly more complicated internal combustion engines and associated control apparatus, in the long run must cost more to maintain than the more simple and more rugged all electric locomotive. Our experience with the electric locomotive teaches us that this trend of increased maintenance expense which has already manifested itself with respect to the diesel will continue."

Roads Move To Increase Car Supply

A three-way program aimed at increasing the nation's serviceable freight-car fleet by some 80,000 new or newly repaired units, and at upgrading additional cars for high-class loading, was agreed to by member roads of the Association of American Railroads at a special meeting held in Chicago on June 24.

The repair program, adopted as "the quickest means of increasing the serviceable freight-car supply to meet anticipated traffic demands," has as its immediate goal a reduction in the number of cars awaiting repair from 6.4% of total ownership (as of June 1) to or below 5%. This repair goal, which will have the effect of adding about 25,000 cars to the serviceable supply, was formally stated in a resolution unanimously adopted at the Chicago meeting.

By another section of the same resolution, the AAR member roads agreed that they would, "to the extent necessary to meet requirements of their shippers," upgrade cars which are "basically serviceable but not suitable for high-class loading." No specific goal was established, however, for this part of the program.

The new-car aspect of the three-way program was not embodied in a resolution, but was announced following an informal poll of roads represented at the meeting, in the course of which they announced their collective intention of ordering at least 38,000 new cars, to cost an estimated $300 million, within a few weeks or months. These cars, added to approximately 17,000 then on order, at a cost of about $150 million, and to the 25,000 to be restored to serviceable condition, make up the total of 80,000 new or newly repaired cars which represent the railroads' immediate goal.

No announcement was made concerning number or types of cars to be ordered by any individual railroad, but the orders, inquiries and authorizations, reported elsewhere in these pages indicate that some of the larger roads are acting immediately to carry out their intentions.

Purpose of the Chicago meeting was to rectify the situation caused by recent declines in the serviceable car fleet in the face of increased demand for cars. Since February 1, 1954, when freight car owner-

(Continued on page 14)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Item No.		Month of April 1955	Month of April 1954	4 months ended with April 1955	4 months ended with April 1954
	Freight Service (Data from I.C.C. M-211 and M-240)				
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	4,966	5,496	19,394	26,577
3-06	Total, Diesel-electric	34,272	31,709	135,535	124,318
3-07	Total, electric	740	655	2,818	2,562
3-04	Total, locomotive-miles	40,186	37,957	158,560	153,778
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,622	1,459	6,254	5,810
4-06	Empty, total	896	850	3,527	3,411
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	11,900	10,965	44,198	50,742
6-02	Total in oil-burning steam locomotive trains	1,547	1,581	5,241	8,692
6-03	Total in Diesel-electric locomotive trains	97,369	87,550	378,559	340,530
6-04	Total in electric locomotive trains	2,272	2,031	8,544	7,825
6-06	Total in all trains	113,810	102,492	439,272	408,923
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.02	1.02	1.02	1.02
10-02	Loaded freight car-miles	43.30	41.00	42.20	40.50
10-03	Empty freight car-miles	23.90	23.90	23.80	23.70
10-04	Total freight car-miles (excluding caboose)	67.20	64.90	66.00	64.20
10-05	Gross ton-miles (excluding locomotive and tender)	3,034	2,880	2,966	2,847
10-06	Net ton-miles	1,365	1,264	1,325	1,251
12	Net ton-miles per loaded car-mile (M-211)	31.60	30.80	31.40	30.90
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.40	63.20	63.90	63.00
14	Averages per train hour (M-211):				
14-01	Train miles	19.00	19.00	19.00	18.90
14-02	Gross ton-miles (excluding locomotive and tender)	56,930	54,172	55,689	53,280
14	Average car-miles per freight car day (M-240):				
14-01	Serviceable	46.70	41.70	45.10	41.50
14-02	All	43.90	39.50	42.40	39.40
15	Average net ton-miles per freight car-day (M-240)	892	769	850	769
17	Per cent of home cars of total freight cars on the line (M-240)	47.80	55.50	50.20	54.40
	Passenger Service (Data from I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	1,415	2,233	5,550	10,121
3-06	Diesel-electric	19,580	20,615	80,473	82,059
3-07	Electric	1,303	1,394	5,363	5,658
3-04	Total	22,299	24,243	91,388	97,839
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	227,226	241,702	921,585	976,116
4-09	Total in coal-burning steam locomotive trains	8,032	11,390	32,075	52,341
4-10	Total in oil-burning steam locomotive trains	3,409	7,380	13,386	31,476
4-11	Total in Diesel-electric locomotive trains	200,469	206,999	814,072	828,640
12	Total car-miles per train-miles	9.78	9.59	9.70	9.61
	Yard Service (Data from I.C.C. M-215)				
1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	263	291	1,000	1,310
1-02	Steam, oil-burning	41	49	164	210
1-03	Diesel-electric[1]	3,425	3,208	13,659	12,935
1-06	Total	3,736	3,558	14,851	14,498
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	8	12	38	53
2-02	Steam, oil-burning	5	4	19	17
2-03	Diesel-electric[1]	234	251	970	1,016
2-06	Total	273	293	1,131	1,195
3	Hours per yard locomotive-day:				
3-01	Steam	5.10	4.40	4.80	4.70
3-02	Diesel-electric	15.20	15.00	15.20	15.10
3-05	Serviceable	15.00	14.30	15.00	14.40
3-06	All locomotives (serviceable, unserviceable and stored)	13.10	12.20	13.00	12.30
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.60	1.69	1.65	1.73
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.75	.75	.76	.76

[1]Excludes B and trailing A units.

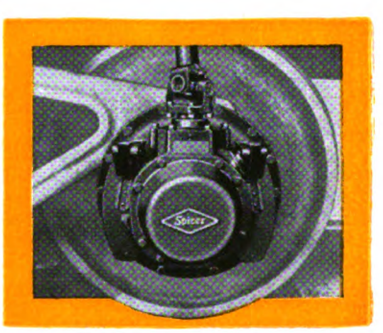
Photo—courtesy of Erie Railroad

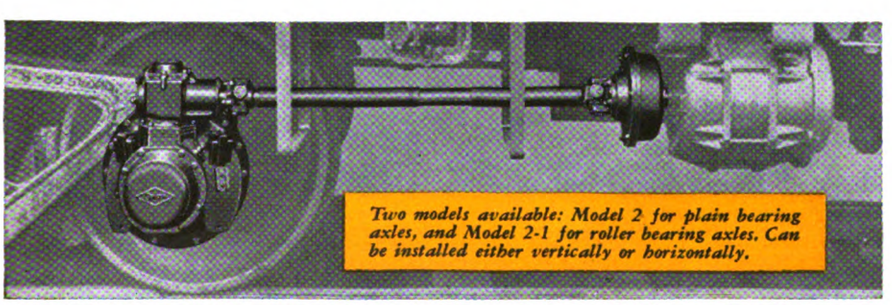
and with a 25-mile radius of track operations through 2-way radio powered by Spicer Generator Drives!

The conductor with 2-way radio has at his command an instantaneous "round-up" of the operating news and conditions on his train . . . *whenever* he needs it . . . *wherever* he needs it.

Mechanical troubles are remedied more quickly. Delays and tie-ups are minimized. Cargo damage or spoilage is reduced. Trains can't get "lost." Changes in train orders can be given en route, with better dispatch and efficiency. A greater measure of safety for train and crew is assured day and night. And operating situations for all trains in a 25-mile radius can be inter-communicated for the benefit of all.

Write for illustrated bulletin No. 323 giving complete details of the new, small ½ to 5 KW Spicer Positive Generator Drive for low-cost adaptation to caboose, baggage, mail and refrigerator cars.





Two models available: Model 2 for plain bearing axles, and Model 2-1 for roller bearing axles. Can be installed either vertically or horizontally.

Spicer

DANA CORPORATION

Toledo 1, Ohio

NEWS

(Continued from page 12)

ship of Class I roads reached a postwar peak of 1,777,080 units, there has been a decline of 57,000 in number of cars owned, and of 75,000 in number of serviceable units, both conditions reflecting the downward trend in railroad traffic and revenues in 1954. Since the first of this year, however, car loadings have increased; through June 25 total revenue loads were 8.9 per cent over those in the corresponding period of 1954. As a result, the substantial net surplus of cars available at the beginning of this year has been converted to a shortage which is currently averaging in excess of 10,000 cars a day.

Mechanical Facilities To Be Provided at New Frisco Yard

Directors of the St. Louis-San Francisco have approved a $16-million yard construction program to provide new or completely rebuilt facilities near Memphis, and at Tulsa, Okla.

Larger of the two projects is a wholly new yard at Capleville, Tenn., near Memphis, to replace present facilities at Yale yard. Work on the new yard has been started and will continue for about 30 months.

At the Tennessee yard a diesel repair and service shop with five engine servicing tracks will be provided. In addition to servicing equipment, the shop will house offices for the general foreman, shop foreman and other personnel, wash and locker rooms for enginemen and shop men, a heating and compressor room, machine, carpenter, electric, pipe, parts reconditioning, air brake repair filter and parts cleaning and radio repair shops.

The repair yard will have a lumber and storeroom track, a wrecker track and three rip tracks—the latter under cover of a full span steel shed 80 by 500 ft mounted 22 ft over the tracks. An adjoining building 20 by 500 ft will house machine, blacksmith, paint and mill shops, supply, tool, air-brake, packing and oil storage rooms, wash locker and heating rooms and an office. There will be a separate storeroom and a lumber storage building.

The Tulsa project will utilize the site and some of the buildings of the present facility there.

Holcombe Parkes Heads Railway Progress Institute

Holcombe Parkes, vice-president and director of public relations of the New York advertising firm of Benton & Bowles, Inc., has been named president of the Railway Progress Institute—formerly the Railway Business Association. Mr. Parkes is located at the RPI's Chicago headquarters. He succeeds P. Harvey Middleton, president of the former RBA, who has retired. Creation of the RPI to succeed the RBA was reported in the July issue, page 14.

Mr. Parkes was an associate editor of the Railway Age from 1919 to 1923.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JULY ISSUE

Diesel-Electric Locomotive Orders

Road	No. of units	Horsepower	Service	Builder
Illinois Terminal	12[1]	1,200	Switching	Electro-Motive
Lake Superior & Ishpeming	1[2]	1,600		Alco Products
Long Island	10[3]	1,600	General purpose	Alco Products
Midland of Manitoba	1[4]	900	Switching	General Motors Diesel, Ltd.
New York, New Haven & Hartford	2[5]	1,700	Passenger	Fairbanks, Morse
Norfolk & Portsmouth Belt Line	5[6]	1,200	Road switching	Electro-Motive
Norfolk Southern	2[7]	1,600	All service	Baldwin-Lima-Hamilton
Seaboard Air Line	10[8]	1,750	Road switching	Electro-Motive
Southern	5[9]	1,200	Trainmaster	Fairbanks, Morse

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Ann Arbor	7[10]	Cabooses	International Railway Car
Atchison, Topeka & Santa Fe	300[11]	70-ton covered hopper	Pullman-Standard
Chesapeake & Ohio	500[12]	50-ton box	ACF Industries
Chicago & North Western	750[13]	50-ton box	Pullman-Standard
	155[13]	70-ton covered hopper	Pullman-Standard
Chicago, Rock Island & Pacific	38[14]	70-ton covered hopper	Pullman-Standard
Denver & Rio Grande Western	100[15]	Stock	Company shops
Detroit, Toledo & Ironton	50[16]	70-ton covered hopper	Pullman-Standard
Florida East Coast	35[17]	70-ton covered hopper	Pullman-Standard
Great Northern	15[18]	Covered hopper	General American
Gulf, Mobile & Ohio	400[19]	50-ton box	ACF Industries
Kansas City Southern	300[20]	50-ton box	ACF Industries
Maine Central	250[21]	Box	ACF Industries
Minneapolis & St. Louis	40[22]	70-ton covered hopper	Pullman-Standard
Norfolk & Western	50[23]	70-ton covered hopper	Pullman-Standard
North American Car Corp.	30[24]	70-ton covered hopper	Pullman-Standard
St. Louis-Southwestern	75[25]	50-ton flat	Greenville Steel Car
	225[25]	50-ton box	Pullman-Standard
Seaboard Air Line	1,000[26]	50-ton box	Pullman-Standard
	200[26]	70-ton covered phosphate	Bethlehem Steel
	200[26]	70-ton covered cement	ACF Industries
Southern	750[27]	70-ton hopper	Pullman-Standard
	750[27]	70-ton hopper	ACF Industries
Southern Pacific	200[28]	Box	Pullman-Standard
	750[28]	Box	Company shops
Toronto, Hamilton & Buffalo	20[29]	70-ton covered hopper	National Steel Car
Wabash	10[30]	Caboose	International Railway Car
Western Maryland	400[31]	70-ton hopper	Bethlehem Steel
Western Fruit Express Co.	100	70-ton bunkerless refrigerator	Pacific Car & Foundry

Freight-Car Inquiries

New York Central	3,000	50-ton box	.....

Passenger-Car Orders

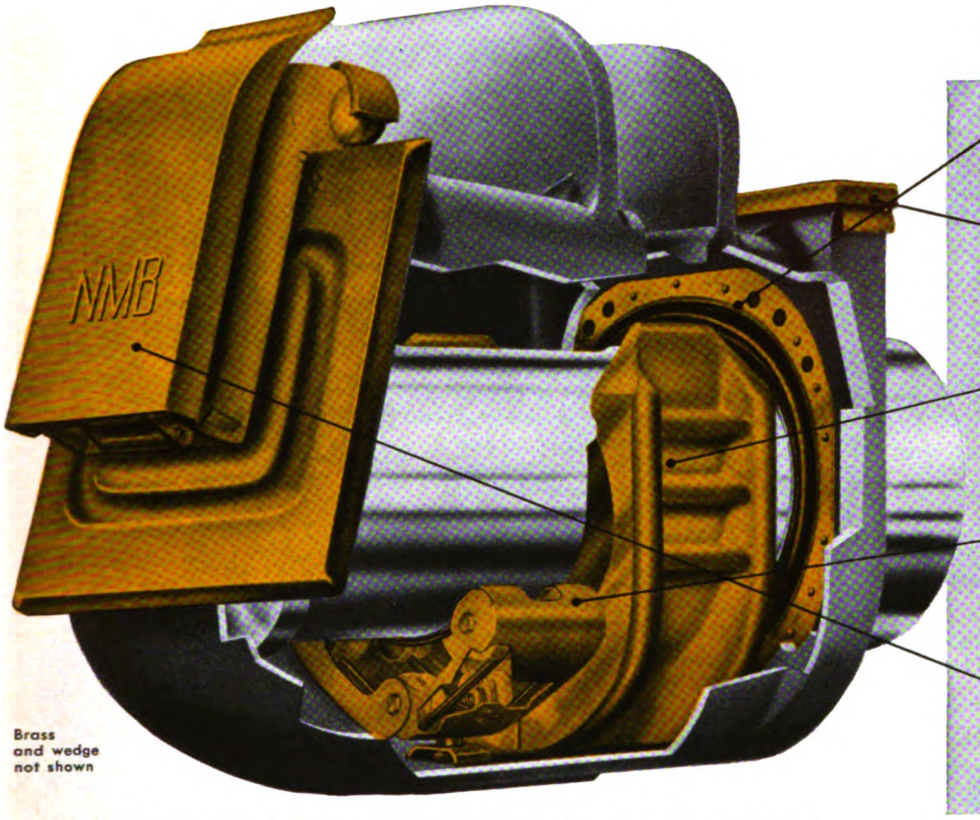
Road	No. of cars	Type of car	Builder
Chicago & North Western	16[32]	Gallery type coaches	Pullman-Standard
Duluth, South Shore & Atlantic	1[33]	Rail diesel (RDC-1)	Budd Co.
Railway Express Agency	200[34]	50-ton refrigerator	General American

[1] For delivery in October. Estimated cost, $1,400,000.
[2] For delivery this month. Approximate cost, $145,000.
[3] At a cost of $1,600,000. Delivery is scheduled for next September and will permit the road to scrap its 12 remaining steam locomotives. The new units, authorization to purchase which was reported in *Railway Age*, May 30, page 10, will give the LI a fleet of 75 diesels, more than half of which will operate in passenger service, pulling about one-fifth of its 690 daily passenger trains. The other four-fifths are self-propelled by third-rail power.
[4] Approximate cost, $126,000. Delivery scheduled for January.
[5] One for use at each end of the double-ended Talgo train which the road has on order from ACF Industries.
[6] These units are part of 15 to be purchased to eliminate steam power on the N&PBL by the end of 1956. Cost of the 15 diesels and necessary facilities is expected to exceed $1,750,000. The road now owns 23 steam locomotives.
[7] Cost, $307,605. Delivery expected November 1.
[8] Cost, $1,600,000. Electro-Motive also will rebuild and convert 12 other SAL diesel units from 1,350 hp to 1,750 hp at a cost of $1,500,000. The units to be converted (purchased in 1942–43) were among the first freight locomotives to be acquired by the railroad. Deliveries of both new and rebuilt units are expected to begin in September and be completed by December.
[9] Delivered in June. Approximate cost, $1,200,000.
[10] For delivery during third quarter of this year.
[11] Deliveries expected to begin in September
[12] Cost, $5,750,000. Delivered schedule for October or November.
[13] Deliveries of box cars scheduled for September and October; the covered hopper cars, August and September.
[14] Delivery completed.
[15] Estimated cost of these double-deck cars, $700,000. Deliveries scheduled for the fourth quarter of this year.
[16] Estimated cost, $440,000. Delivery expected August 15.
[17] Cost, $259,000.
[18] Estimated cost of these Airslide cars, $200,000. Delivery scheduled for November.
[19] Deliveries to begin in November.
[20] Estimated cost, $1,900,000. For delivery during first quarter of 1956.
[21] Estimated cost, $1,900,000. For delivery in December and January.
[22] Approximate cost, $300,000. Delivery expected this month.
[23] Approximate cost, $400,000. Cars delivered.
[24] Approximate unit cost, $8,000. For delivery this month.
[25] Approximate cost flat cars, $540,000; box car, $1,750,000. Flat cars for delivery in October; box cars, during third quarter of this year.
[26] Deliveries of box cars expected to be completed by end of first quarter of 1956. Covered hoppers to be delivered by end of 1955.
[27] To cost over $10,000,000. Deliveries to begin in October.
[28] Cost, $8,250,000.
[29] For December delivery.
[30] Delivery expected during third quarter of this year.
[31] To be equipped with Timken roller bearings. Estimated cost, $3,300,000. Delivery scheduled for October.
[32] Approximate cost, $2,240,000. The cars (air conditioned for suburban service) will be basically similar to the 16 recently delivered to the C&NW. Performance of the recently delivered cars, and commuter reaction to them, has been studied, and as a result minor modifications will be made in the design of the

(Continued on page 18)

NMB Lubricating System uses "long" solid bearings; is quickly installed without journal box alteration

A.A.R. APPROVED FOR INTERCHANGE SERVICE ON 10,000 CARS



5 PRINCIPAL PARTS

A. OIL SEAL. Keeps oil in; dirt, water, brine and snow out.

B. DUST GUARD WELL COVER and FILTER. Exclude dripping water, snow, brine; yet permit breathing.

C. JOURNAL GUARD BEARINGS. Eliminate axle damage during humping, coupling, starting or heavy braking.

D. OIL CIRCULATOR. Lubricates bearings with ½ turn of axle. Guarantees continuous lubrication. Bearings run 50° cooler.

E. JOURNAL BOX LID and WAFFLE GASKET. Provide tight oil and water seal at front opening. Eliminate vibration wear.

The NMB Sealed Journal Box Lubricating System†

is the result of applying modern automotive engineering principles to a century-old railroad problem. Developed by NMB in collaboration with 3 major western railroads, the NMB System provides modern, sealed oil bath lubrication and exclusion of foreign matter from solid bearing journal boxes.

Installation is made in the standard A.A.R. journal box. No alteration is required. Waste packing formerly used for lubrication is eliminated (no waste grabs). NMB Systems for 5″ x 9″, 5½″ x 10″ and 6″ x 11″ A.A.R. standard solid bearing journal boxes can be shipped promptly.

* Based on operating experience of major Class I railroads
† "Patented" and "Patents Pending"

NEW MANUAL describes simple, inexpensive installation steps. **PARTS & PRICE LIST** shows all System parts, gives quantity purchase prices. Sent immediately without obligation.

NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS
3470

For complete information or consultation at your headquarters, write or telephone nearest NMB Railway Equipment Division Offices.

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NMB has manufactured tens of thousands of oil seals for roller bearing cars and over 1,000,000,000 oil seals for AUTOMOBILES • TRUCKS • TRACTORS • AIRCRAFT • MACHINES • HOUSEHOLD APPLIANCES

ORDERS AND INQUIRIES *(Continued from page 14)*

second lot, including a change in seating. The study indicated commuter reaction to the new cars has been "highly enthusiastic."

[33] Estimated cost, $164,000. Delivery expected this month.

[34] Cost, $4,000,000. The cars are in addition to 300 previously ordered (page 25, February issue). Delivery of the additional units is expected to begin late in the third quarter of 1955.

NOTES:

Atchison, Topeka & Santa Fe.—The Santa Fe has ordered 50 baggage-car shells from the Pullman-Standard Car Manufacturing Company. Deliveries will begin about December 1.

Erie.—The Erie directors have authorized purchase of 1,000 box cars at an estimated cost of $8,000,000.

Missouri-Kansas-Texas.—The M-K-T directors have authorized purchase of 600 freight cars at an approximate cost of $4,500,000. Included are 150 50½-ft 50-ton double-door box cars; 50 50½-ft 50-ton box cars equipped with damage-free loaders; 300 40½-ft 50-ton box cars; 75 70-ton covered hopper cars; and 25 50-ton flat cars. The flat cars will be built in the Katy's Dension, Tex., shops.

St. Louis-San Francisco.—The Frisco board of directors has authorized purchase of 2,000 freight cars to cost $16,000,000. Included are 700 50-ft box cars; 650 40-ft box cars with 8-ft doors, Nailable Steel Flooring and rubber draft gears; 200 70-ton roller-bearing-equipped covered hopper cars; 200 65-ft drop-end mill-type gondola cars; 100 50-ton 53-ft flat cars; and 150 wood rack cars. The last two lots will be built in company shops and will have cast steel underframes.

Union Pacific.—The UP will apply to 700 freight cars, for $174 a car, the new circulating oil lubricating system developed by the National Motor Bearing Company. The UP installation will be the largest so far by any railroad. The new lubricating system, developed at the instance of the UP as a means of overcoming the hot box problem, and first tested on 10 of the road's fast merchandise cars, was described and illustrated in the January issue, page 11. The 10 cars are now reported to have traveled an average of more than 90,000 miles each, with better than expected results. Journal-box temperatures have been consistently about 50 deg F lower than those with traditional waste pack lubrication on the same trains. Wear on bearings and journals is said to have been only a minute fraction of that in waste-packed boxes, and oil consumption has been reduced about 90%.

PERSONAL MENTION . . . . . .

Atchison, Topeka & Santa Fe

J. H. ARMSTRONG, shop superintendent at Topeka, Kan., retired.

H. V. GILL, superintendent of shops at San Bernardino, Cal., appointed shop superintendent at Topeka, Kan.

V. L. MARLO, master mechanic at Argentine, Kan., appointed superintendent of shops at San Bernardino, Cal.

J. W. LUKE, master mechanic at Chicago, appointed master mechanic at Argentine, Kan.

H. N. CHASTAIN, general supervisor of diesel engines at Chicago, appointed master mechanic at Chicago.

Baltimore & Ohio

A. K. Galloway

ALEXANDER K. GALLOWAY, general superintendent motive power and equipment at Baltimore, retired on August 1. *Born*: St Thomas, Ont., October 1, 1885. *Career*: entered railroad service July 1, 1902, as a machinist apprentice on the Michigan Central. Served as machinist, shop foreman, roundhouse foreman, and general foreman on the MC until November 1, 1914, when he became acting master mechanic on the B&O at Baltimore. Was subsequently general master mechanic at Cincinnati and at Baltimore; district master mechanic at Baltimore; superintendent motive power, Western lines, at Cincinnati, and superintendent motive power at Baltimore. From December 1, 1936, to January 1, 1942, superintendent motive power and equipment on the Reading and Central of New Jersey, with headquarters at Reading, Pa. Then appointed general superintendent motive power and equipment, B&O, at Baltimore, with jurisdiction later extended to include B&O Chicago Terminal and Staten Island Rapid Transit. *Other activities:* chairman, Mechanical Division, AAR, 1948-49.

A. J. LARRICK, regional master car builder at Cincinnati, retired.

R. A. GARRIGUS, general car foreman at Washington, Ind., appointed regional master car builder at Cincinnati.

Canadian National

JOHN G. SPANKIE, material inspector in the research and development branch, retired.

Canadian Pacific

G. E. BALES, locomotive foreman at Smith Falls, Ont., appointed division master mechanic, Montreal terminals.

A. S. LAVALLIER appointed division master mechanic, Farnham (Que.) division.

W. STEWART, district master mechanic, Pacific region, at Vancouver, B.C., appointed assistant to superintendent of motive power and car department at Calgary, Alta., with responsibility for repair schedules on the road's diesel power in the west.

A. T. REYNOLDS, division master mechanic at Calgary, Alta., appointed district master mechanic at Vancouver, B.C.

N. WOOLLEY, general air brake inspector out of Winnipeg, Man., appointed division master mechanic at Calgary, Alta.

D. R. LANGDON, mechanical instructor at Winnipeg, Man., appointed general air brake inspector out of Winnipeg.

Central of Georgia

JOHN R. MOCK JR., car foreman at Columbus, Ga., appointed chief car inspector, Headquarters, Savannah, Ga.

Chesapeake & Ohio

H. M. VISE, general car foreman car department at Huntington, W.Va., appointed assistant to general superintendent car department at Richmond, Va.

E. I. ELLIS, foreman in erecting department at Russell, Ky., appointed general foreman, Russell car shop.

P. R. HUMPHREYS, assistant supervisor work simplification at Huntington, W.Va.,

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
April, 1951	2,996,562	3,702	8,914	12,616	237,521
April, 1952	2,766,313	3,826	7,759	11,585	238,784
1953					
March	2,904,227	2,696	6,077	8,769	331,192
April	2,850,752	3,383	6,435	9,818	290,359
May	3,013,610	5,892	11,433	17,325	173,945
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,7933	63,197
April	2,787,705	3,471	6,485	9,956	280,002

The MODERN Southern Pacific uses the MODERN Diesel lubricant

GULF DIESELMOTIVE OIL

104 YEARS AGO a small wood-burning locomotive forged the first link in what is now the gigantic Southern Pacific transportation system. Today powerful Diesels thunder over the maze of rails that make up this modern system which serves eight Western and Southwestern states.

Throughout the territory served by a subsidiary, the Texas and New Orleans Railroad, Southern Pacific Diesels are lubricated with Gulf Dieselmotive Oil. This modern Diesel lubricant contributes to better performance, greater availability, and lower maintenance costs on many of our nation's leading railroads.

here's why:

1. Effective detergent action prevents harmful piston ring belt deposits.
2. Base stocks are selected for their ability to help prevent hard deposits on the piston crown and in the ring belt area.
3. 100% solvent refining (removing undesirable constituents) insures greater stability and better bearing protection.

Gulf Sales Engineers, experienced in railroad Diesel operation, are always available to aid you in maintaining high standards of lubrication throughout your system. Consult the telephone directory for the number of your local Gulf office.

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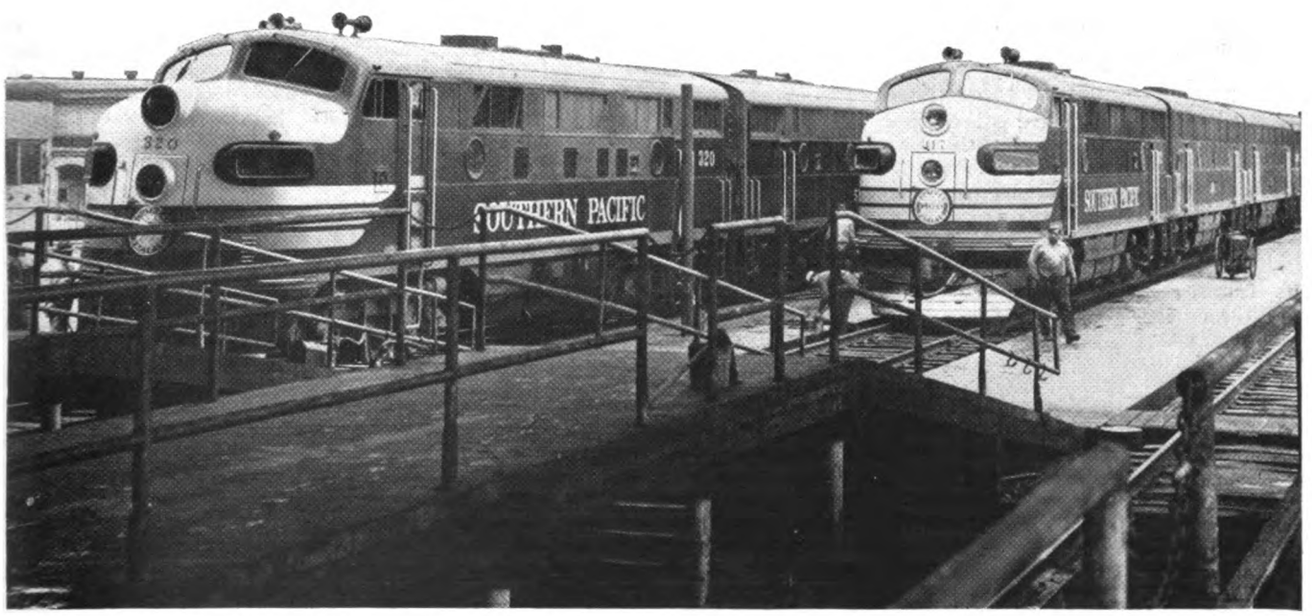
THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS



appointed assistant shop superintendent at Huntington.

T. P. HACKNEY, assistant supervisor of work simplification at Huntington, W.Va., appointed shop engineer at Richmond, Va.

GUY P. GIBBS, assistant general manager, Southern Division, appointed system general manager of motive power and car utilization. Headquarters, Huntington, W.Va.

Chicago, Milwaukee, St. Paul & Pacific

G. H. KOESTER, assistant to superintendent of motive power, appointed mechanical engineer, with headquarters at Milwaukee.

L. H. RABUN appointed master mechanic at Milwaukee.

J. L. BROSSARD appointed master mechanic, Twin City terminals, at Minneapolis.

CARL MCMULLIN appointed district general car foreman at Miles City, Mont.

D. A. RADABAUGH appointed assistant master mechanic at Harlowton, Mont.

Norfolk & Western
Roanoke Shops, Roanoke, Va.

EARLE G. SPEESE, erecting shop foreman, retired.

G. P. BOWMAN, wheel shop supervisor, appointed foreman of erecting shop.

O. H. SUMMERS, JR., test engineer, appointed assistant electrical engineer.

Tulsa, Okla.

W. G. BLANKENBAKER, assistant general car foreman, appointed general foreman, car department.

Southern

ROSCOE H. BIBLE, general foreman car repairs at Meridian, Miss., appointed general foreman car repairs at Knoxville, Tenn.

Spokane, Portland & Seattle
Vancouver, Wash.

C. E. BARNES, general superintendent motive power, retired.

St. Louis-San Francisco
Springfield, Mo.

DUNCAN J. RITCHIE, superintendent motive power, appointed general superintendent motive power.

R. W. EGE, principal assistant electrical engineer, appointed electrical engineer.

W. R. BROWN, assistant electrical engineer, appointed principal assistant electrical engineer.

Obituary

ARTHUR H. KEYS, superintendent car department of the Baltimore & Ohio, died suddenly on July 2. *Born:* Baltimore, Md., September 21, 1899. *Education:* Carnegie Institute. *Career:* Became a messenger on B&O in Pittsburgh on February 13, 1913.

A. H. Keys

Subsequently M.C.B. clerk; car foreman Youngstown, Ohio, and Curtis Bay, Baltimore; general car foreman, Baltimore, Cumberland and Pittsburgh divisions; master car builder, Pittsburgh; assistant superintendent car department, Baltimore, and, beginning April 15, 1948, superintendent car department. *Other activities:* president International Railway General Foreman's Association (1930-37), president Car Department Officers Association (1952-53), New York Railroad Club, Pittsburgh Railway Club, a director of Eastern Car Foreman's Association, and member AAR Mechanical Division Loading Rules Committee.

SUPPLY TRADE NOTES

AMERICAN STEEL FOUNDRIES.—*John A. Rassenfoss* has been appointed manager of the Manufacturing Research Laboratory, and *C. G. Mickelson* and *P. J. Neff* have been appointed assistant managers. The laboratory is a consolidation of the former Research Laboratory and the Process Development Department. It is located in East Chicago, Ind.

■

ALLEGHENY-LUDLUM STEEL CORPORATION.—*Richard J. Swan* has been appointed director of sales, magnetic and electronic materials, and *Milton M. Fenner, Jr.*, has been appointed director of sales, tool and die steels.

■

GENERAL MOTORS CORPORATION.—*Dr. Lawrence R. Hafstad*, physicist and authority on atomic energy, has been appointed director of GM's research division at Detroit. The appointment will be effective later this year.

■

ACF INDUSTRIES, INC.—*Rudolph Furrer*, vice-president, has been placed in charge of manufacturing and engineering for the parent company and has been named president of the Nuclear Energy Products division. *John E. Angst*, district sales manager of American Car & Foundry division, and *Ellsworth B. Carpenter*, western sales manager of that division, have been appointed vice-presidents, sales, at Chicago and St. Louis respectively. *Harry R. Cole*, assistant works manager, of the St. Louis Car plant of the American Car & Foundry Division, has been appointed works manager.

■

WILSON ENGINEERING CORPORATION has opened a new general office at 6 N. Michigan ave., Chicago.

■

PENNSYLVANIA SALT MANUFACTURING COMPANY.—*William P. Drake*, executive vice-president, succeeds *George B. Beitzel* as president.

■

GRIP NUT COMPANY.—*C. A. Henrickson*, sales engineer for the Grip Nut Company, has changed his headquarters from Minneapolis to Milwaukee, but will continue to service the Minneapolis-St. Paul area.

■

AMERICAN BRAKE SHOE COMPANY.—*William J. Grant* has been appointed southern sales manager for railroad products for three company divisions—National Bearing, Southern Wheel and Brake Shoe & Castings. Mr. Grant will continue to be located in Norfolk, Va. He was previously manager of southern sales for National Bearing division.

PYLE-NATIONAL COMPANY.—*Harold R. Weibel* has been named district manager of railroad and industrial sales at St. Louis, succeeding *R. P. Underwood*.

■

RAIL & INDUSTRIAL EQUIPMENT CO.—*John N. Hartman* has been appointed superintendent of tank car repairs at Landisville, Pa. *B. Porter Kuszmaul* has been appointed sales and promotion manager, with headquarters at 30 Church street, New York. Mr. Hartman was formerly superintendent of tank car repairs for the Shippers' Car Line at Milton, Pa.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*J. Lyle Thomas* has been named sales manager, Railway division, in Richmond, Va., succeeding *John R. Kingman*, recently advanced to the company's general offices in Cleveland, on special assignment with the Railway division.

Mellor W. Stevenson has been appointed sales manager of the division at the St. Louis office—1420 Ambassador building. Mr. Stevenson was previously located at Chicago.

■

YOUNGSTOWN SHEET & TUBE CO.—*Richard J. Stamberger*, sales representative at New York, has been appointed assistant New York district sales manager.

(*Continued on page 109*)

COR-TEN Steel construction can pay off big

To reduce maintenance costs and increase service life...

Virginian Railway has made USS COR-TEN Steel a vital part of its car building and rehabilitation program

AFTER TAKING A HARD LOOK at the steadily rising cost of freight car maintenance, the Virginian Railway in 1947 launched a program designed to minimize such costs by using car construction that would increase time between shopping periods.

As a result, The Virginian in the past eight years has used USS COR-TEN Steel in 4872 open-top freight cars and, as part of a continuing program, is at present rebuilding 652 55-ton hopper cars in its own shops with this superior high strength steel.

This important coal carrier chose USS COR-TEN Steel because extensive tests and available records showed the service life of hopper car plates of USS COR-TEN Steel to be 50% to 100% greater than open hearth copper steel. So the Virginian figured that by using COR-TEN Steel in rather large quantities, they could also save money in rather large quantities, in spite of the slightly higher cost of COR-TEN Steel construction.

Here's how Mr. L. W. Doggett, Mechanical Engineer of the Virginian, puts it. "Our present practice when building new hopper cars or making heavy repairs for the first time to existing cars is to make all plates of USS COR-TEN Steel with the sides ¼" thick, upper floor sheets and ends 5/16" thick, and all other plates, including door plates, ⅜" thick. With this construction, we feel that such cars can be kept in regular service twenty years or more before making heavy repairs, after which four years can be added by patching."

The attached table is worth your careful study. It shows how USS COR-TEN Steel construction pays off—at a ratio of more than 3 to 1—in reducing maintenance costs in Virginian Railway 55-ton hopper cars. It is on the basis of such demonstrated greater economy in service that USS COR-TEN Steel has been used in more than 46,000 hopper cars and 32,000 gondolas. Proved economic advantages are the reasons why more than 195,000 freight cars have been built better with USS COR-TEN Steel since 1933. Would you like us to figure how much you could save with such construction?

TYPICAL COST COMPARISON FOR 1000 55-TON HOPPER CARS USING USS COR-TEN STEEL OR COPPER STEEL BODY CONSTRUCTION

CONSTRUCTION COST of 1000 CARS	Cost of heavy repairs* after 12 years at $1150 per car	Cost of heavy repairs* after 20 years at $1425 per car	Cost of heavy repairs* after 24 years at $1150 per car	Total cost of heavy repairs
COPPER STEEL at $5,000 per car $5,000,000	$1,150,000	.....	$1,150,000	$2,300,000
USS COR-TEN Steel at $5,275 per car $5,275,000	.....	$1,425,000	.....	$1,425,000

Additional Cost of USS COR-TEN Steel....$275,000
Per car....$ 275

Total Repair Saving by USS COR-TEN Steel .....$ 875,000

*Of plates only

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

EDITORIALS . . . . . .

Why Go To Chicago?

The writer of this editorial note has attended a lot of pre-convention committee meetings over the years and has heard many railroad men make the remark that the expected attendance at the annual will be good "if so-and-so is *allowed* to come to the convention . . . . . ". This raises a real question, "Is it a fact that there are mechanical, and even higher, railroad officers who think they're doing their men a favor by sending them to a convention of technical associations?" If it is a fact that the meetings' papers and discussions are not of sufficiently high caliber that any railroad doesn't get back fifty dollars in maintenance savings for every dollar spent in sending a man, then they're probably sending the wrong man.

The September Coordinated Meetings will be packed with dollar-saving value and if we had more space we could give 14 good reasons why every road should send representatives in proportion to its size. There they will find, by association with 3,500 other people, the one best answer to their latest problem whether it be locomotive, car or shop machinery. The September Meetings will be the central trading post for bargains in "problem solving". A dollar saved in maintenance cost is a dollar increase in net. Good ideas are the dividends of the September Meetings but "you got to go there to get them".

"Volts Times Amps Is Horsepower"

The instructor in the diesel school said, "Suppose we have two 3,000-ton trains on parallel level tangent tracks each hauled by a 3,000-hp diesel-electric locomotive. One locomotive is geared for 65 mph and the other for 85 mph. They will start together and run as fast as their ratings permit." Then he put the question, "Which train will arrive first?"

No one in the class of 51 volunteered an answer, but when the question was put to individuals they would guess one train or the other. After much guessing, supported by some argument, one student said, "They would arrive at the same time." But this theory found no supporters. The guessing went on. It would be one train or the other.

That was four years ago, and you who are reading these lines undoubtedly know that if neither locomotive exceeds limiting current values or permissible motor speeds, the two trains will arrive together. The motors of one locomotive will run more slowly than those on the other and will carry more current, but the product of volts times amperes (divided by 746), which is horsepower, will be the same for both locomotives. There might be minor differences in efficiency in case the higher copper losses in the slow locomotive exceeded the higher iron losses in the faster one but this difference is so small as to be of no practical significance.

The important factor in the present situation is that while the mechanical department men are aware of these fundamentals, it is difficult to impress upon the operating department the facts that too low speeds will damage insulation, and what is perhaps more important, that motor speeds which are too high are not only dangerous but also very bad for commutators and all parts susceptible to vibration and high voltage.

Fortunately, motor and generator designs are being constantly improved and as thermal capacity of machines is increased, the universal locomotive for all classes of service comes nearer to being a reality. But don't let the designers lull you to sleep. Attention to this characteristic of locomotives is still necessary, and spreading of the gospel to those who use them will be reflected in happier conditions in the shop.

What Kind of Trial

A short while back we heard an interesting story that may have become slightly exaggerated in passing from one person to another. It illustrates what many observers feel is a sharp difference in the approach taken by railroads to the acceptance of new ideas and products compared to industry generally. It also raises the interesting question as to which approach is the more desirable.

The story concerns a salesman for a new brand of paint. He called on a railroad mechanical officer who said he would give the paint a trial if the salesman would leave him five gallons as a sample. The salesman did this and was told to come back five years later when he would be told how well his paint stood up.

Five years later the paint salesman returned to see how his paint made out and he was told that it seemed to be all right as far as could be told from a test of such a small sample. In order to learn more about this paint, the railroad man decided to buy another 100 or so gallons. Again the salesman was requested to return in five years to see how his paint made out when applied in larger quantities.

Thus, five years after the larger-scale test was begun and 10 years after the initial test, the salesman returned with the eager expectation that his product would at last be acceptable. But, unfortunately, when he arrived on the scene he found that the man he had been talking to retired two years previously. The new man in the job knew nothing about the test.

So, what was the salesman told that he must do if he wanted to join the railroad's list of suppliers? Leave a five-gallon sample for an initial 5-year test.

Now, this story may not be exactly true in every last detail. And paint is perhaps not the ideal analogy because this is one product on which many railroads run accelerated tests. But it would seem safe to bet that hundreds of incidents quite similar to this in principle happen every year on the railroads. And it raises the question as to whether the railroads generally are overly conservative in accepting new ideas. Do they require

more test information than is economically desirable for the best interests of the industry? Is there room for more accelerated tests within the railroad industry?

Suppose, as an example, you could get 90 per cent as much information from a 30-day accelerated test as from a three-year service test. Now and then a product would slip by the accelerated test, be accepted and put in service only to be found later that it is not suitable for every day railroading. It is also true, of course, that such errors will be somewhat costly.

The big question still remains. Would many products pass an accelerated test that would not be satisfactory for day-in and day-out routine use? Would the premature acceptance of a few such ideas not be a minor expense alongside the potential gain of having money-saving ideas accepted one to three years sooner because of the more rapid completion of accelerated tests?

Letters To the Editor

Life of a Diesel

To The Editor:

The answer to the question concerning the economic life of a diesel-electric locomotive, which was raised in your June issue, depends on many things, but mostly on the concept of railroad management as to what constitutes an economic power unit.

Many people think about locomotives as the Irishman thought of his razor. Pat had a razor that he said he had been using for 40 years. He neglected to explain, however, that the razor had two new blades, and three new handles during his ownership.

Another thing Pat failed to consider was that the new safety razors and electric shavers, had improved safety conditions and had made shaving both safe and easy.

As with razors, so with diesel-electric locomotives, we must consider obsolescence.

There seems to be a general idea that present-day locomotives can give economical service, when properly maintained, for at least 20 years. In fact, they could be perpetuated indefinitely by replacement of component parts, but the economical limit, will, of course, depend upon the rate at which more efficient units of new design are developed.

A few years ago, a leading locomotive manufacturer was discussing this question, and he said his plans were to protect the railroads for at least 20 years on any locomotives manufactured by his company. He explained that he intended to keep available, for a 20-year period, repair parts to replace those that the customer might require.

He further expressed the thought that after 20 years, locomotives of new design would make it undesirable to continue to replace in kind the original equipment.

A recent order of the I. C. C. for establishing "A Uniform System of Accounts for Railroad Companies," reads in part as follows:

"When the cost of renewal of a unit of equipment, exclusive of the expense of dismantling and of repairs of old parts re-used exceeds 50 per cent of the replacement cost new of the kind and class as rebuilt, at the time of rebuilding, the unit shall be considered as rebuilt."

"The rebuilt unit shall be accounted for as an addition and the old unit accounted for as retired from service."

Different roads have different ideas as to whether they should completely rebuild locomotives or whether overhaul costs be held to limits which will avoid their being added to capital account.

The writer's opinion is that the majority of maintenance officers wish to maintain locomotives in kind, hoping that when rebuilding becomes necessary, the service earnings rendered by the unit will justify its replacement with a greatly improved unit of new design.

Regardless of any other consideration the life of a diesel-electric locomotive depends on how it is maintained. Anyone that attempts to operate a diesel-electric locomotive on a plan of extracting locomotive-service-miles without restoring service-miles through proper maintenance is due for a rude shock. To find your locomotive-service-miles account overdrawn is indeed bad.

It has been said, "The future has in store exactly what's placed in store for the future." That idea applies to maintenance of diesel locomotives, and has great bearing on the economic life of a diesel-electric locomotive.

Guy Franklin

Sand Blast for Rails

Los Angeles, Calif.

To the Editor:

I can see little merit in the suggestion by Waves Blackwood in your April 1955 issue, that sand blasting, instead of the usual method of applying sand would be a suitable means of preventing locomotive wheel slip. Consider, for example, a four-unit diesel locomotive with a tonnage train having to start on a heavy grade. The locomotive being equipped with the sanding assembly previously mentioned in the magazine, the sand naturally would be directed to the top surface of the rail. When an attempt is made to start the train, there is a short period of standstill, during which time the sand could cut the rail badly at all places where it is applied. Then the train goes a considerable distance at slow speed, while the sand is being forced to the rail under sand-blasting pressures. The sand would then be digging into the rail surface, resulting in earlier than usual rail change, especially on grades and curves in mountain territory, where the sand would be used most.

Also, we have plenty of trouble keeping sand and brake shoe dust out of our electrical equipment, and I am sure a sand blast under the locomotive would add considerably to this difficulty. It would seem to me, therefore, that the increased rail wear and hazards to both rails and electrical equipment would automatically rule out this method of gaining traction.

S. W. Blake

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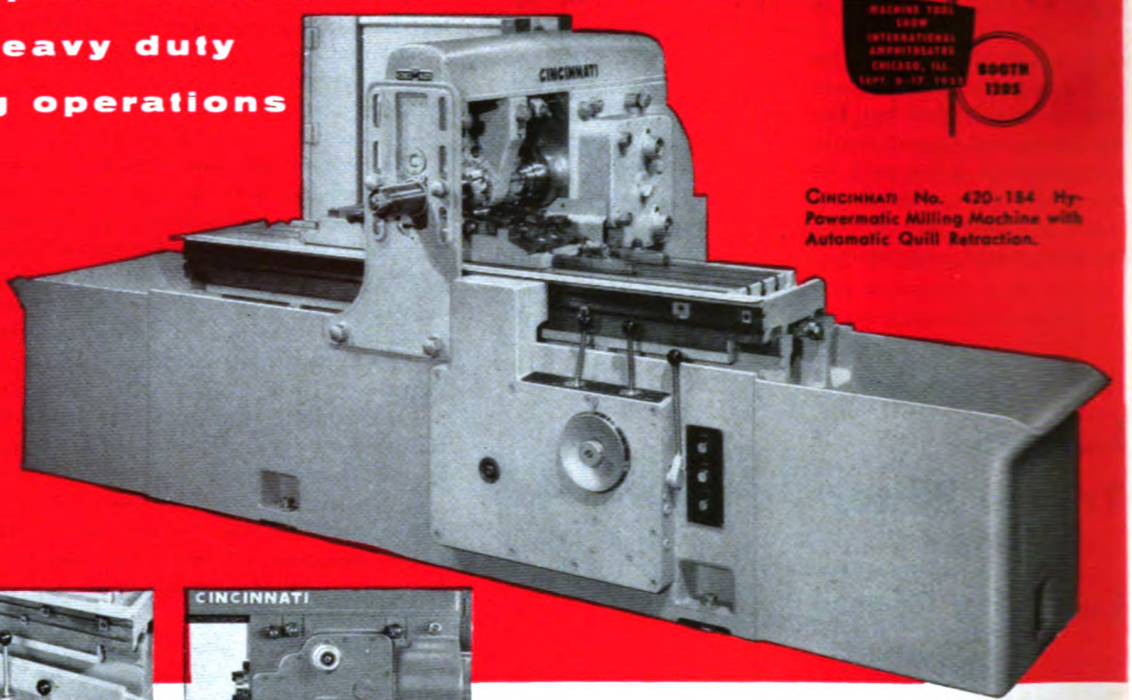

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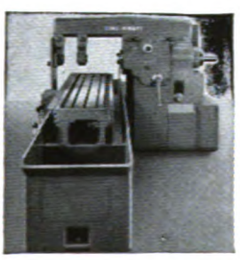

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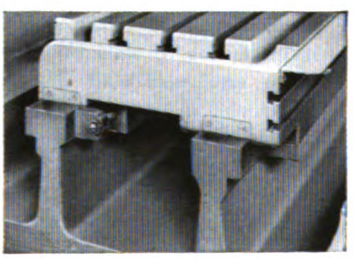

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Competition the Theme of Mechanical Division Meeting

Its implications as to regulation, quality and quantity of freight cars, and plans for future progress stressed in addresses at Montreal in June

"A wise and a distinguished educator, in an address which I had the privilege of hearing a short time ago, said that no law exists making human progress inevitable; progress is not something to be taken for granted; rather it is something that we must work at and plan for, with foresight and wisdom."

Thus spoke N. R. Crump, president of the Canadian Pacific, in the opening address, Tuesday, June 21, of the AAR Mechanical Division and Electrical Section. About 1,600 members and guests attended the three-day meeting at the Sheraton-Mt. Royal Hotel, Montreal.

Mr. Crump outlined the processes by which ideas are developed by the engineer and sold to someone who can raise the capital—someone who is comparable to railway management. In order to attract capital into private enterprise the prospects for profit in the enterprise must compare reasonably well with those of other industries.

"This urge to find more productive ways of using capital," said Mr. Crump, "is the dynamo that keeps our system going and growing. That's what makes America tick. The search for profit and the avoidance of loss are the compelling forces and the disciplines to which all management in private enterprise is subjected."

Much of the present regulation of Canadian and U. S. railways is based on the assumption that they still have a monopoly. "Basically the problem is one of harmonizing regulation and competition," he continued. "Some degree of regulation may still be needed to assure regularity and dependability of common carrier service. Regulation, however, should be designed to encourage the flow of capital into the different forms of transportation in such a way as to produce the most economic combination of transportation plant and facilities."

The railways, he said, are asking for equality of opportunity and equality of responsibility under regulated competition in the transportation industry.

"Everyone here serving on committee has his own responsibility with a railroad," said R. G. May, vice-president, operations and maintenance department, AAR, in his address at the opening session. "He not only finds the time to serve his own company but the industry as well. In most cases this participation in committee work requires being away from home and job. Yet the time and service are given willingly and without thought of personal gain. It is this spirit which provides the answer to how North Americans have developed a rail transportation system capable of moving more goods and more people at less cost than any other system anywhere."

There can be no let-up in efforts to develop increased efficiency, improved service and safety, he said, in order to meet the continuing demands, present and future.

"We cannot accept the progress already made as anything approaching a goal," Mr. May continued. It is inevitable, he believes, that studies will be accelerated to apply atomic energy in railroad locomotives.

"The close working arrangement with the Electrical Section has solved many of the problems arising in connection with additional improvements in the electrical and electronics field for the mechanical officer. . . . We can envision microwave for the remote control of switches, closed-circuit television enabling completely automatic recording of cars, radar control of car coupling speeds, instantly produced graphs showing load shifts in cars, and possibly an entirely new development in the field of refrigerants. . . ."

In his opening remarks, D. S. Neuhart, chairman of the AAR Mechanical Division and head of the UP's mechanical department, pointed out that the AAR becomes qualified to carry out its original objectives of promoting both the public interest and the general good of the railroads only to the extent that its constituents make it qualified. Too many members become so engrossed in their own responsibilities that they contribute all too little to the association.

The very nature of the railroad business demands collaboration. "It requires," continued Mr. Neuhart, "that we join ranks as one to improve our service and economic status as a whole. That is the function of the AAR. So, too, is ferreting out causes of poor performance; bringing about corrective measures without delay—and throwing off the cloak of tradition where it slows progress."

At the conclusion of the opening ceremonies the Mechanical Division proceeded to consider the matter of the 17 reports which made up its 1955 program. Abstracts of these reports and the high spots of the discussion after their presentation appear in this issue.

Later sessions were addressed by Owen Clarke, member of the Interstate Commerce Commission, and C. G. A. Rosen, consulting engineer, Caterpillar Tractor Company. Mr. Rosen's address appears separately in this issue.

NEW MEMBERS OF GENERAL COMMITTEE

At the annual meeting at Montreal the following members of the Mechanical Division General Committee were elected to serve until June 1957: B. M. Brown, general superintendent motive power, Southern Pacific; H. T. Cover, assistant vice-president and chief of motive power, Pennsylvania; J. L. Robson, chief mechanical officer, Great Northern; A. C. Melanson, chief of motive power and car equipment, Canadian National; J. W. Hawthorne, general superintendent motive power, Atlantic Coast Line; and J. A. Welsch, general superintendent motive power, Illinois Central.

Officers of the Mechanical Division continue to serve for another year.

A program for railroad men was set forth in a luncheon address by S. F. Dingle, operating vice-president of the Canadian National. To build for the future, he advised railroad men "to shrink where we should shrink . . . to grow where we should grow . . . to exploit our special advantages as our competitors do . . . to be free as prudent businessmen to change the pattern or character of service, or in extreme cases to substitute alternative transport services and close down rail operations . . . to take a more aggressive attitude toward competitors . . . and to perform the extra duty that each of us has as a citizen and a railroad man to educate the public in the railroads' case."

Mr. Dingle called attention to the fact that though Canada has more miles of railroad per capita than any country in the world, truckers get a quarter of the freight revenue for hauling 10% of the traffic.

He also emphasized that the CNR does not represent a socialist experiment. It was built primarily to develop the country. Its main difference from private roads is that the Canadian people as a whole are the stockholders. It, and the Canadian Pacific, are operated in a framework of competitive equality, with both equally subjected to regulations of a government board.

It is all right to unite and seek legislative relief to enable the railroads better to keep pace with the changes in transportation, but, there are other remedial steps which are far more important, said Interstate Commerce Commissioner Owen Clarke in his address.

First, and most important of all, he said, is the need to cultivate what he termed the "competitive instinct." Above everything the leaders of the industry must improve upon the *quality* of the transportation service they sell. Assembly-line methods and low inventories require that transportation be geared to constant and continuous production. Studies indicate that three-fourths of the shippers who abandon the railroads do so because of failure in this respect.

Time of delivery, both on the road and in terminals, must be speeded up, too, said Mr. Clarke. "Terminal delay is a wasting disease that gnaws at the vitality of most railroads. Cars are hurried over the road and then buried in yards for days on end." Keep cars out of yards as much as possible, he said, and also improve the yards.

The speaker showed that the railroads are now in a car shortage of serious proportions—79,680 fewer cars on May 15, 1955, than 18 months earlier—and on May 1, 1955, there were 113,543 bad-order freight cars.

The ICC is "deeply concerned" about the long-range effect of car shortages, Mr. Clarke declared. "There is no question that failure to furnish freight equipment when it is needed causes the diversion of traffic from the rails, a portion of which will never be recovered."

The time has come, he said, to give greater freedom to creative ideas in a stepped-up program of research. Such a program must be backed up with real courage to throw out the old in favor of the new.

"Railroad planning must be lengthened in range. While there is always need for the short-term view, it is no longer sufficient in itself. Short-term considerations of management must be part of a longer-range plan—a plan for a decade or for a generation. Certainly those in the railroad industry who planned for long-range growth ten years ago have since profited by that planning. . . .

"Our inescapable and underlying reason for optimism is our population increase. By 1975, "it is anticipated that we will have 55 million more people to feed and to house and to clothe. . . . So long as railroad leaders have faith in the future of America and are willing to plan accordingly, there can be no doubt that rail transportation will maintain its place of commanding importance in our national economy and our arsenal of defense."

Tank Car Rules Rewritten

The complete set of specifications for tank cars has been rewritten to incorporate all changes made since 1941. The revised edition will be in loose-leaf form to simplify keeping it current with each individual specification complete in itself.

During the rewriting inconsistencies were eliminated, nomenclature slightly revised, and appropriate paragraphs added or deleted with the intent of establishing uniformity between all specifications. Six specs were declared obsolete, four new ones adopted and six AAR appendices added, revised or in the process of revision.

Open-Top Loading Rules

The Supplement to Department of Defense Pamphlet MD-7. issued May 15, 1955, includes 12 new loading methods for boats, landing crafts, semitrailers, rocket launchers, tractors, truck bodies and material handling equipment cranes, fork lifts and tractors.

Requests have been brought to the attention of the committee which the shippers insist must be met if the rail carriers expect to retain the present volume of business. The principal proposals are:

1. The necessity of furnishing equipment in clean and good physical condition to enable the shipper to properly and safely secure his commodity for rail shipment.
2. The necessity of providing adequately equipped flat cars to permit shippers to secure loads with a minimum amount of securement and blocking.
3. The possibility of furnishing bulkhead type flat cars to prevent delays resulting from shifted loads and toward the more economical preparation of shipments.
4. The need of furnishing equipment which will provide a loading method more comparable to that followed on shipments using other forms of transportation.
5. The necessity of immediately and very materially reducing the damage occurring on shipments due to improper handling in transit.

The report presents detail changes in the open-top loading rules, based on inspections and experimental shipments, which have been approved in joint conference with the shippers and are

D. S. NEUHART
Chairman

C. E. POND
Vice-Chairman

W. M. KELLER
Executive Vice-Chairman
Director of Research

F. PERONTO
Secretary

expected to be issued soon in a Supplement to the MD publications.

As in the two loading-rule reports, the importance of meeting the desires of shippers as to types of equipment and methods of loading flat and open-top cars was the dominant note in the discussion.

According to one car department officer, loading rules are increasing in importance because the economic value to shipper and consignee of mechanical handling of lading on and off cars is increasing the amount of freight which is being loaded on open-top cars. Another aspect of railway traffic which will require adaptation of the loading rules is the growth of the piggyback movement. This has already begun to move in interchange. One officer foresees the need for rules for securing trailers on flat cars and for securing the contents in the trailers

New Wheels to Get Tests

The report of the Committee on Wheels gave details of manufacturing and service tests of the AAR X-2 and AAR X-3 cast steel wheels produced by the Southern Wheel Division and Griffin Wheel Company, respectively. They now have limited approval but additional installations will be authorized by the committee. Interchange Rules and Manuals have been changed to incorporate these wheels. An application has been received to authorize service tests of a centrifugal cast steel wheel produced by a division of the United Steel Companies of England. It was recommended that this wheel be approved for limited installation and shown in the Interchange Rules. It will be designated the AAR X-4.

Further work is to be done on the effectiveness of ultrasonic inspection of diesel locomotive wheels, and on the tolerances, marking and classes of wrought steel wheels. Work on the effect of shot blasting on diesel wheels has been stopped, but a study of the dimensions of these wheels continues. A new 40-in. diesel locomotive wheel and a 34-in. wheel for RDC cars were recommended for letter ballot adoption. A recommendation was made to the Arbitration Committee on the responsibility for overheated tubular axles. Revision of the Wheel and Axle Manual has been delayed and seven changes have been issued instead.

Safety Appliances

The ICC Bureau of Safety has given the AAR a proposal to revise the Safety Appliance Regulations in existence since 1911. The draft indicated that required changes would have serious effects on railroads and would be costly, according to the Safety Appliance Committee. Some AAR counterproposals have been prepared and a working committee is cooperating with ICC representatives to prepare a modified proposal. Approval of safety appliance details for tank cars with no precedent involved 206 committee actions during the year. Six designs of metal running board have been tested and approved for inclusion in the Interchange Rules, and a brake step design is pending.

Floor discussion brought out the point that present equipment conforming to present safety regulations will not have to be changed to meet the revised code. Members will be given an opportunity to comment on this before final adoption in the hope that the new provisions can be complied with on all new construction.

Lumber Loading Improves

Changes in pole and lumber loading methods, included in a supplement to Pamphlet MD-3 issued last year, mainly covered confining the overhangs to a single end of the pile, leaving one end square, and the location of piles not over 6 in. apart. These changes have materially decreased the number of loads requiring adjustment en route. Consignees and consignors are better satisfied because of the vastly improved transportation time of lumber shipments, both packaged and otherwise.

Experience with experimental loads using ¾-in. by .035-in. high-tension bands for top-unit ties on lumber shipments have led the committee to approve their use in place of the 1¼-in. by .035-in. bands now specified in the various drawings of loading methods.

Approval of the request of shippers that the loading of 8-ft lengths of packaged lumber be permitted (now restricted to a minimum of 10 ft) is expected to increase lumber shipments by rail.

A method of utilizing all side-by-side packages in a pile has been worked out to control the end shift of packaged lumber moving on conventional flat cars. It is meeting with success beyond all expectations. The method utilizes two additional interlacing ties per pile. These are passed through the top half of the bottom or intermediate tier and through the bottom half of the top tier. They tie all packages, both vertically and horizontally, into a single unit. A photograph of such a car on arrival at Chicago from South Fork, Colo., shows the lading in the same condition and same location on the car as when loaded.

The committee also describes a new method of loading lumber on flat cars with permanent end bulkheads. No full-length stakes are used, but 3-ft stub stakes are applied in all stake pockets as a safety measure. All packages in the lower tier are tied together, as are all in the top tier. All packages are then tied into a single unit with overall and interlacing ties. The packages are protected from the elements with sheets of polyethylene plastic applied on top of each bundle when it is packaged at the mill. Since September 1954 over 50 such shipments have been made from Goodwater, Ala., to points in Illinois and Michigan without a single car being shopped en route.

The committee makes a strong plea for the use of flat cars with permanent end bulkheads for the shipment of lumber. It recommends bulkheads extending 8 ft 6 in. above the floor, with

43 ft 3 in. clear length, wood floors 9 ft 4 in. wide, and stake pockets. Such a car, the committee says, will accommodate 95 per cent of the commodities moving on flat cars. The new method of loading, using the bulkhead cars, can reduce the cost of loading and unloading for the benefit of shippers and consignees as much as 75 per cent. To the railways it offers the opportunity to build up lumber traffic.

Prices Revised Upward

The Committee on Prices for Labor and Material carries on a continuous analysis of material, labor and new equipment costs. Changes shown in the committee's annual report are published in a supplement to the code of interchange rules effective August 1.

Labor charges and combined labor and material charges are increased by an award for paid holidays averaging two per cent of present basic rates of pay and by an award for health and welfare benefits averaging one per cent of present basic rates of pay.

Material and parts prices show small changes, most of them upward. Exceptions are couplers, most of which are a few cents cheaper, several sizes of journal boxes, brake beams and extra heavy pipe. Prices of passenger car axles are down.

Axle Research Continues

A final report on the fatigue tests of 5½ by 10-in. freight car axles is being prepared by the Committee on Axles. On the basis of the tests, the committee recommended, for letter ballot action, the adoption as an alternate standard to the AAR standard (black collar) axle, the "forged" freight car axle with raised wheel seats for plain or roller bearings.

Research is continuing on the effect of heating on fatigue resistance of plain bearing axles. Overheating in actual service does affect the fatigue strength of axles. The effect of copper penetration was not determined. The effect of a second overheating of axles in service was under investigation, but has been discontinued because of insufficient data and lack of specimens. It is planned to use the EMD test car to continue work on the development of fatigue cracks between axle seats in AAR roller-bearing passenger car axles. The Navy continued to use the fatigue test equipment at Canton whenever possible, but Timken has informed the committee that it needs the space occupied by this laboratory. It is to be moved to the research center at Chicago.

Couplers and Draft Gears

The Subcommittee on Couplers early in 1954 supervised tests of the controlled slack coupler to determine if its strength and operation would allow its adoption as an AAR alternate standard for the Types H and F couplers on passenger cars. The tests were financed by five coupler manufacturers and were conducted in the laboratories of two of these companies. Results have shown that the coupler has satisfactory strength, but that it undergoes greater shortening under compressive load than do Tightlock couplers. To change this, manufacturers have agreed to increase the section of the controlled slack coupler. The Committee recommended that this coupler be submitted for letter ballot as an AAR alternate standard on passenger cars.

Action was taken to prohibit interchange of passenger cars equipped with Pitt type couplers after January 1, 1956. To correct its weakness, McConway & Torley redesigned the head for casting in high-tensile steel and has called this the MT coupler. Stronger than the Pitt type, the MT can be a replacement for the Pitt coupler without any alterations to the car. Submitted to the Arbitration Committee was the recommendation that the MT coupler have approval only as a substitute for the Pitt type, but not as an alternate standard.

The Committee acted against permitting the bushing of out-of-round pin holes in coupler heads and knuckles. To insert a bushing would impair the strength of the pivot lugs and knuckle hub, and with a round-hole bushing, would load the pin with the entire buffing load. Permission for reclamation by welding the back end and keyway of yokes, now prohibited by Interchange Rule 23, was requested by a member road. Because the back end of the yoke is a critical region, the Committee felt that a porous weld, an uneven change in section, or poor normalizing could cause failure. Keyway build-up had been suggested if wear was not greater than ¾-in. This wear would mean that the boss and reinforcement would be worn away at the front of the slot. While proper welding and heat treatment could reclaim yokes, it was decided that the risk involved would not allow this rule change which would then apply to all shops.

Coupler Subcommittee Surveys

Reported were the results of a survey started when a member road reported unsatisfactory performance from the AAR alternate standard Type E swivel shank coupler. Roads with 168,165 equipped cars reported a very small percentage of failures and the majority did not recommend discontinuing manufacture, although there are indications that the coupler is not standing up as it should and this has been reported to manufacturers.

Magnaflux inspection of new couplers, an addition to the visual inspection of Specifications M-204 and M-206, was suggested by a member road. Submitted to 33 roads, response showed that 90.6 percent felt there was no need for this inspection, either mandatory or optional. The Committee had reported that a mandatory inspection with resulting repairs would add up to $2.75 to coupler cost, and that optional inspection would cost up to $6.00

A hole cast in the knuckle tail to reduce weight has been the origin of cracks in high-tensile steel coupler knuckles. This hole was discontinued in 1950, and a member road asked what others are doing about taking these knuckles out of service. Two roads have arbitrarily removed them from cars, while others are allowing normal replacements to do the job. The Committee decided there was no justification for recommending that arbitrary removal be ordered by the AAR. These sections were submitted by the Subcommittee on Couplers headed by Committeeman Chairman, C. K. Steins, Mechanical Engineer of the Pennsylvania.

Draft Gear Certification

Following tests, the Committee acted to give conditional approval to Miner Class FR-16 and to Cardwell Westinghouse Type R-20 rubber draft gears with applications limited to 6,000 gears. Cardwell Westinghouse Type L-200-S-1, a short pocket gear, was tested, approved, and will be added to Interchange Rule 101. With the agreement of its manufacturer, Peerless DA draft gear has been removed from the AAR approved list and will be removed from the Interchange Rules. This gear had conditional approval, but none were ever sold. Applications have been received for specification tests on five short pocket rubber gears: Cardwell Westinghouse Types R-18, R-175 and R-185, and Miner Classes FR-69 and FR-100.

Draft Gear Subcommittee Recommendations

Increased draft gear capacity without developing excessive center sill reactions can best be obtained with longer travel gears. While producing a non-standard design, permission has been granted to a member road for the installation of 4½-in. travel gears in 36-in. pockets on 150 new refrigerator cars. Member roads are asked to channel manufacturers' requests for non-standard draft gear installations through the AAR. It is not the intention to stop development work, but to avoid interchange difficulties. When sufficient study and service information is available the Committee will make a recommendation on increased draft gear capacity.

Maximum draft gear reaction, the force delivered to center sills, is a direct function of the friction draft gear capacity just before it goes solid. This is usually about 500,000-lb, and rubber draft gears have been rated on the basis of a pre-determined travel that will give this same reaction. Rubber draft gears rated in excess of this capacity when certified by the AAR can deliver these greater forces to the car structure. The Committee states that large draft gear capacity alone will not protect a car or its lading from damage.

Giving heavy repairs to 150 old refrigerator cars, a car owner requested permission to replace Type G Farlow springs with the pads used in rubber cushioned draft gears. The Subcommittee ruled this was not a violation of Interchange Rule 2, but advised that conversion to complete approved gears be considered because of the eventual salvage value. Check tests were made on 28 gears of seven types with up to seventeen years' service. The appendix of the report contains the results of these tests at the laboratory now in Chicago.

Discussion

Comments on the report indicated general approval of the Committee's recommendations and actions. The coupler manufacturers, to whom the Type E coupler failures were referred, see little opportunity to increase its strength. A change of material would effect a limited improvement. More than this would require a complete redesign of a coupler which is gradually going out of use.

That the only way to reduce center-sill pressure with the draft gear is to increase the travel was emphasized several times. The Committee is asking two questions: 1. How much capacity can be obtained without changing the distance between the truck center and the coupler striking plate? 2. How much capacity must be provided?

A long-travel gear development was initiated on the Santa Fe for application on mechanical refrigerator cars to protect the refrigerating equipment from the effects of violent shocks. A draft gear manufacturer was asked to cooperate.

Interchange Rules

During the past year Arbitration Cases 1846 and 1847 were decided, and the following principal changes were recommended in the interchange rules:

Rule 1

Addition of a note to paragraph 4 so that a class A car will not receive a lower classification if it is temporarily in bad order condition because it requires minor body repairs. It will be considered as a bad order Class A car.

Rule 2

Modification of Par. (4) of Sec. (g) to provide for paid holidays expense and health and welfare benefits recently awarded to operating employees.

Rule 3

Addition of new Par. (a-1-c) to prevent the application of used air brake equipment having obsolete parts to new and rebuilt cars.

Addition of new Par. (f-2) to require a uniform width of deck on flat cars built new so as to provide for the adoption and use of shipments on flat cars of bundled, packaged and boxed material of uniform widths.

Modification of Par. (j-3) to provide for cars having extended repack periods. It now states that empty cars may be rejected when 3 months overdue for repacking, rather than when the repack date was more than 21 months old.

Addition of new Par. (t-1-d) specifying heavier swing hangers on Allied Full-Cushion trucks to eliminate failures which have been experienced with lighter designs.

Modification of parts of four rules (17, 88, 101 and 122) to provide for the use of the recently approved Cardwell Westinghouse type R-20 and Miner Type FR-16 rubber draft gear.

Rule 32

Addition of a new note following Par. (10-k) to establish responsibility for fire damage caused by defective floor type air circulating fans.

Modification of Item 1-(a) of Par. (12) (a) to eliminate border line cases and make the road loading the car responsible for contamination damage when loaded with any hides, pelts or skins. (These no longer need be green, green salted or salted as before.)

Addition of new Interpretation 10 to make the handling line responsible for damage to car caused by striking car float apron or parts thereof unless the car violates the AAR clearance diagram.

Rule 60

As recommended by the committee on Brakes and Brake Equipment, addition of new Note 7 to require that renewal of bushings in triple valve, control valve or AB valve operating portions be done by the air brake manufacturers.

Rule 66

Modification of Par. (b) to permit the use of wooden dust guard plugs when properly secured so they won't get lost.

Modification of Par. (g-2) to make more lenient the requirement for repacking 12-17-month boxes and to eliminate the penalty. This penalty is no longer felt to be justified under present operating conditions. It was also felt that complete repacking attention at reduced periods is needed only where packing is removed from all journal boxes in both trucks to make other repairs.

Addition of new Par. (h-2) to provide requirements and charges for cars having repack stenciling which indicates a repack period longer than the standard 18 months.

Addition of new fourth note to Interpretation 4 to eliminate from service older types of packing retainers (those without a downward offset in each horizontal leg to clear the axle collar which have been causing damage to journals and resultant hot boxes. (This subject was also covered in Rule 101 in which a table listing approved retainers was modified.)

Rules 70 and 98

Addition of new Par. (h) to Rule 70 and new note following Par. (c-7) of Rule 98 to provide an outlet for AAR X-2 and AAR X-3 experimental cast-steel wheels removed in good condition and credited to car owner, on the same basis as one-wear wheels, per Par. 7 of Rule (98-c). Also the addition of new Par. (c-9) to Rule 98 to provide disposition or credits for new design AAR X-4 experimental cast-steel wheels.

Rule 86

Addition of new Par. (c-1) to provide for scrapping tubular axles at the expense of the car owner if the required wheel shop examination shows the Brinell to be below minimum requirements (227).

Rule 101

A new design of brake beam safety support was recommended for inclusion in the Table.

Passenger Car Rules

The addition of a new note following paragraph (j) to show that cars on which the improved and strengthened "MT" type high tensile steel coupler has been substituted for Pitt type couplers are acceptable in interchange.

Addition of new note following Par. (j) of Rule 2 to provide for the use of the improved and strengthened "MT" type coupler in passenger cars in place of Pitt type couplers.

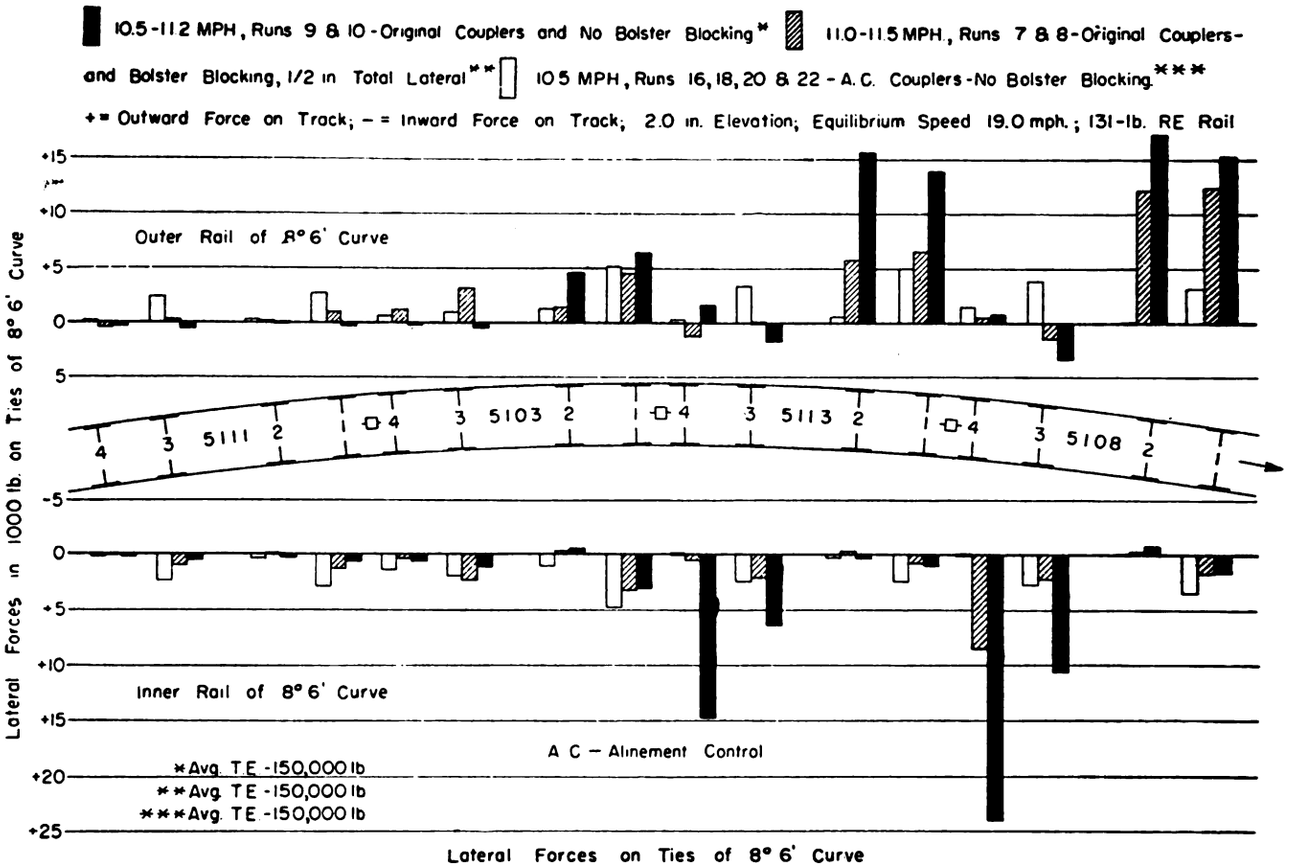
Modification of Par. (g) of Rule 8 to make the handling line responsible for missing metallic steam heat connectors as well as other parts of the steam and air lines to provide protection to the owners of the many cars that have 18 inch of pipe between the end valve and the steam connector.

Performance of Locomotives

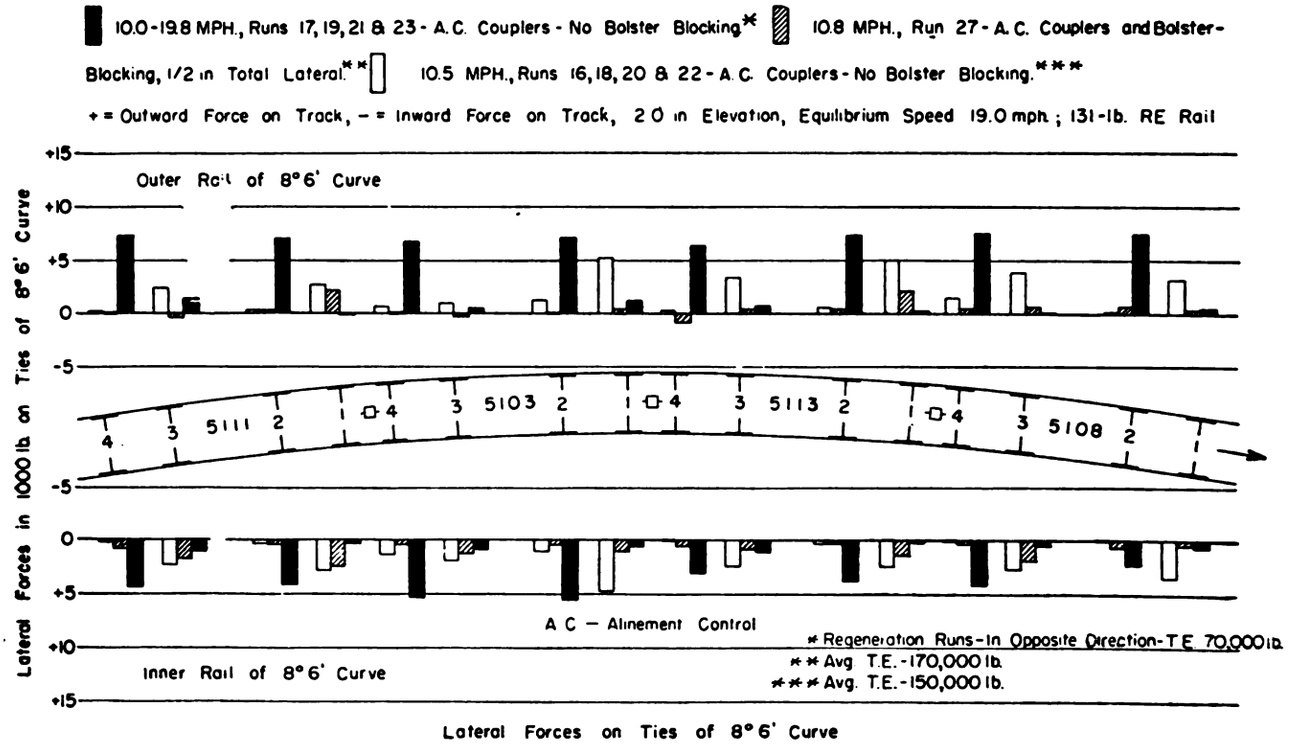
This year's report on locomotives, outside of a progress report on both steam- and gas-turbine developments, dealt largely with brake equipment for diesels, flange lubrication, and jack-knifing of diesels in multiple-unit operation.

The report showed that the Union Pacific now has 25 gas turbine-electric locomotives operating in pool service west from Green River, Wyo., to Ogden, Utah (175 miles), and east from Green River to Cheyenne (307 miles). During 1954 these locomotives hauled 6,204,959 thousand gross ton-miles with train-miles totaling 1,817,059. One unit has accumulated 306,472 miles. The first 10 units in service, in 1952 and 1953, accumulated 2,187,976 locomotive-miles. The availability of all is about 80%.

The N&W No. 2300 steam turbine-electric has undergone tests since July 1954 that have demonstrated its ability to handle tonnages equal to or greater than the N&W Y6b or Class A Mallets with fuel savings up to 30%. No difficulties attributable to the



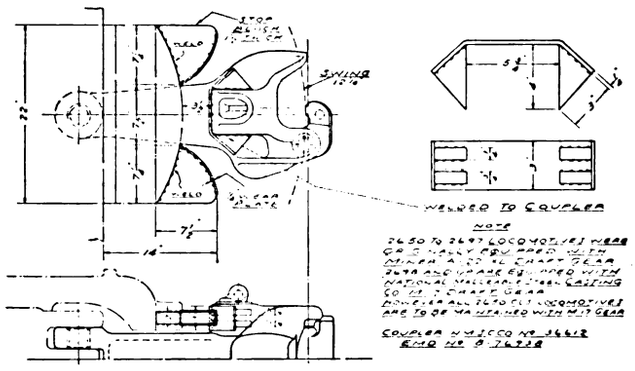
The use of bolster stops or of the new alignment-control coupler showed a reduction in maximum lateral forces.



Bolster stops and the alignment-control coupler showed best performance. Dynamic braking gave high lateral loads.

basic design of the locomotive have been experienced to date. Electrical maintenance is comparable to the diesel-electric. To March 1, 1955, the No. 2300 had accumulated 28,000 miles of service.

The coal-fired gas-turbine unit of the Locomotive Development Committee, up to March 30 this year, had accumulated 388 hours of operation, not counting the 1954 tests. The average load during these tests was 3,300 hp with a coal rate of 0.96 lb/hp-hr.



Railroad designed, this device only limits coupler swing during pushing operations and leaves it unlimited at other times.

Continuous runs of 53 hr have been made without trouble with the ash separation system.

The general opinion of the committee, with respect to flange lubricators and track oilers, was that longer wheel and track life may be expected with the use of lubricators but that each railroad must determine for itself how important flange wear really is and then decide on an economic basis what measures are justified. One advantage, however, in m-u operation of diesels is the indirect effect of reducing flange wear due to jack-knifing.

Jack-knifing—Tests and Solutions

The jack-knifing of two or more diesel units coupled in multiple has had serious results. It has been found increasingly serious as more units are coupled together. The most extreme results have been experienced in heavy pushing operations when four coupled units have developed such great lateral forces that one of the units or the caboose, or both, have been derailed, or rails have been overturned. Lateral forces also have resulted in excessive flange wear and in the overheating of the thrust bearings at the end of the axle. During one test, the temperature of the thrust block on one axle had a temperature of 450 deg F at which time the throttle was reduced to prevent failure of the bearing. Heavy dynamic braking has shown the same effects, but lateral forces are not as great.

In cooperation with the AAR's Engineering Division, four GP-7 locomotives were tested in pusher service. The test track section was an 8-deg 6-min curve located on a 1.72 per cent ascending grade. Within a mile of the curve, the grade increased to 2.2 and 2.4 per cent so that the train was on the heavier grade when the pusher was on the test track. Lateral pressure on the track, lateral movement of the head of the rail, and stresses in the web were recorded by instruments on the ground. Speed and drawbar records were obtained with a dynamometer car. Lateral load on the axles, thrust bearing temperatures, draft gear motion, and bolster lateral swing were measured on the second pusher unit from the train. A number of combinations of standard couplers, special alignment-control couplers, and bolster stops were tested in both pushing and dynamic braking operations. It was shown that the alignment-control coupler and bolster blocking gave the lowest lateral forces. In dynamic braking the outward force on the outer rail was very uniform throughout the four units and with 70,000-lb retarding force, the rail pressures were greater than those with 150,000-lb pushing force. Maximum lateral force was exerted at the trailing wheels of each truck and there was a corresponding outward force on the inner rail of the curve at the opposite wheel. Jack-knifing between the first and second units followed the pattern of rail pressures and measured 11 to 12-in. with no blocking, 3 to 4-in. with ½-in. total lateral, and 0 to 3-in. with alignment control couplers and no blocking.

The alignment-control coupler and draft gear requires a special draft gear pocket, but an arrangement fitting the standard pocket is under development by one manufacturer. The builder of the locomotives used in this test has a standard application of bolster stops and is supplying them as basic equipment on all general-purpose locomotives geared for 70 mph or less. Railroads have been developing solutions of their own, and one line has designed a rubber cushioned bolster stop. It was felt that this device might impair the riding qualities of the locomotive at higher speeds, but in a single-unit passenger operation the stops were reported to have a steadying effect. Limiting coupler swing was the approach used by another railroad. This device does not limit the swing until the draft gear is compressed by heavy pushing operations. Under no load, or when pulling, the swing is not restricted. Even the application of the Type F tightlock coupler has been effective in preventing jack-knifing.

New Refrigerator Car Specifications

New specifications for standard refrigerator cars suitable for fruits and vegetables are submitted by the Committee on Car Construction and recommended for letter-ballot action. The principal changes are the addition of provisions for welded construction; increase of permissible height, floor to ceiling; insulation increased from 3 and 3½ in. thick to 4 and 4½ in. thick; and thermal conductivity in Btu per inch of thickness per sq ft per degree difference of temperature reduced. The specifications call for floor racks capable of supporting heavy lift trucks, provisions for stage icing (formerly optional), drain tubes extending below the journal-box opening, and sliding as well as hinged side doors.

Side Frames and Bolsters

In answer to a request sent all member roads, 242 broken side frames were reported by 50 member roads for the year ended March 1, 1955. Only seven of these were failures of AAR approved designs. Two pattern sizes of a single design accounted for 16 failures; another, for 15. The subcommittee proposes to eliminate 10 of the non-approved patterns, for each of which four or more failures were reported, by prohibiting them in interchange, effective January 1, 1957. It proposes further that new cars built on or after January 1, 1956, must be equipped with approved side frames, and that after January 1, 1960, all freight cars must be so equipped to be acceptable in interchange.

These proposals are presented for the consideration of the Car Construction Committee as a whole and the Arbitration Committee.

Inadequate Box-Car Design

The alternate standard light-weight welded box car, the drawings for which are in the Supplement to the Manual, has been rendered inadequate by faster speeds, longer trains and step-ups in switching operations. The committee recommends that the drawings of this design be made obsolete and removed from the Supplement.

The committee proposes that the box-car drawings in the Supplement to the Manual be changed to show floor boards 2⅜ in. thick, supported by three 6.7-lb Z-bar longitudinals on each side of the center sill. The present 1¾-in. boards, supported by two longitudinals on each side of the center sill, are no longer considered strong enough.

"Full-Cushion" Trucks a Problem

In its 1953 report the Car Construction Committe recommended that cars equipped with Allied Full Cushion trucks be prohibited in interchange. This was later withdrawn and certain maintenance measures recommended to avoid some of the accidents then occurring. The committee now recommends that the trucks be overhauled at two-year intervals and specifies the procedures which should be followed. All derailments should be reported and owners should consider a replacement program. The Arbitration Committee has included in this year's report an added paragraph in Rule 3 requiring that, effective January 1, 1956, these trucks which move in interchange must have the improved swing hangers and swing-hanger shoes shown by the committee in this report.

A subcommittee has prepared revised specifications for repairs to certified brake beams to include the Number 24 beam and new types, and to clarify the matter of repairs to beams when the fundamental relation between the tension and compression members is not disturbed. Wear or corrosion limits of tension members of different designs are also set forth.

Provisions for heavier brake levers and larger brake-levers pins

are also proposed for use with brake beams of 24,000-, 28,000- and 36,000-lb capacity, in order that AAR recommended fiber stress limits be not exceeded.

Other Items

A subcommittee proposes that the height of the rim of the truck center plate be reduced from 1¼ in. to 1⅛ in. to relieve the heavy contact between the rim of truck plate and the body center plate. The interference occurs after 15 or more years of wear. The report describes a simple mounting for an air-motor grinder by which the rim of existing truck center plates can be ground down to the 1⅛-in. height.

It is recommended that changes be made in the Manual and interchange rules to permit the splicing of centersills on cast steel underframes without the use of splice plates. This is proposed as a letter-ballot item.

When cars are moved after journal-box lids are opened for inspection the lids on gondola and flat cars tend to catch above the inward flange at the bottom of the side sill.

The report illustrates a horizonal shield plate welded to the bottom of the sill, under which the journal box lid remains as the truck turns on a curve.

Confusion arises in utilizing cars originally built for freight-train service but later converted for passenger-train service without changing the numbers to a passenger-car series.

The Operating-Transportation Division proposed the following rules for such conversions: 1. The changes must be approved by and the cars be acceptable to the AAR Mechanical Division as passenger equipment. 2. The cars must be numbered in a passenger car series distinguishable from a freight car series. 3. The cars must be registered as passanger equipment in the Official Register of Passenger Train Equipment.

The committee proposes the necessary changes in the Manual to carry out the Operating-Transportation Division's requirements, and submits them for letter-ballot action.

Discussion

Comment on the report suggested that the committee was rather liberal in permitting the use of altered designs of truck side frames to accommodate the various integral details such as brake hangers, spring planks, and others. These increase the difficulty of supplying replacements when necessary.

Referring to the recommendation with respect to box car floors consideration was asked for the application of perforated plates on the floor area between the doors. It was suggested that the replacement of swing hangers on the Allied full cushion truck, as recommended by the committee, was far from an adequate rehabilitation of these trucks.

Specifications for Materials

Material specifications prepared by ASTM, SAE and other industry-wide agencies will be used as AAR standards wherever practical in the future. They will be reprinted with an AAR specification number but will also include the number of the other organization which originated them. Materials conforming to industry-wide standards are frequently available at lower costs than AAR standard material. When applicable for railroad service, the committee will approve the use of the other standards, and will continue to write specifications only for those items peculiar to the railway industry.

Work is going on with oil companies and engine builders to develop test techniques for measuring the performance of railroad diesel lubricating oil. The committee approved a joint committee action which prepared a specification for fire resistant refrigerator car insulation.

Recommended was letter ballot action on the following specifications with the changes indicated: M-101, Carbon steel axles—Dimensional tolerances; M-103, One-wear wrought steel wheels—Permissible quality variation; M-116, Structural steel—Mechanical properties and marking; M-122, Carbon steel bars—Agreement with commercial practice; M-611, Coolant system hose—Elimination of entire specification; EM-904, Renovated journal box oil, and EM-906, New journal box oil—Elimination of both specifications and substitution with single specification M-906-55, Journal box oil, with changes in viscosity requirements. Submitted as information were changes in the following specifications: M-105, Carbon steel for forging—Editorial change; M-501, Lined journal bearings—Inspection practices; M-601, Air brake and signal hose—Change in marking; and M-910, Renovated journal box packing—Editorial change.

Brakes and Brake Equipment

Stuck brakes under investigation by the committee since 1950, continue to interfere with train movements. The conditions contributing most to this are the leakage of AB portions gaskets, brake pipe leakage in excess of AAR limits, and general freight car maintenance. Leakage of AB portion covers has been greatly reduced by portion-back-cover reconditioning and satisfactory gaskets. Over 60 percent of all leakage is through defective angle cocks, pipe couplings and nipples, and air hose couplings and gaskets. A recommendation was made to the Arbitration Committee that there be arbitrary in-date testing of air brakes on all cars on repair tracks and that this be a mandatory requirement of the Interchange Rules.

Specifications for clamps used on brake pipe, signal and straight air hoses on cars and locomotives were prepared and recommended for letter ballot. A second letter ballot item is the recommendation that Manual pages B-71-1955 and B-72-1952 be revised to show inspection gauges that will measure hose couplings and not pass those that contribute to leakage. Another ballot item is a change of outside diameter on the shank of the hose end of nipples and air hose couplings to maintain a proper dimensional relation between the shank and bead at the point where the hose clamp is applied. A faster and more complete single car test for freight cars on repair tracks is the aim of the recommendation for a letter ballot on replacing Manual page B-17-1955 with a new diagram showing a test device incorporating the flowrator, dummy test coupling and larger air gauge the committee considers as improvements. Testing procedures using this device are now under study. During the year the QRR brake cylinder release valve specification was adopted by letter ballot and is incorporated in the manual.

Brake and Brake Equipment Recommendations

It was recommended to the Arbitration Committee that used AB brake equipment applied to new or rebuilt cars after January 1, 1956, be required to incorporate the following components—filter protective charging chokes, self-oiler main pistons and cylinders with non-pressure heads and integral return spring guides. They also received a recommendation that AB control valve bushing renewals should be done only by air brake manufacturers to use only the current standard design. The Committee for Specification of Materials was advised that Specification M-401 should be revised to set a limit on pattern letter thickness on the guide lugs of brake shoes. The Committee on Locomotives was advised that diesel units should use standard angle cocks on both ends, or at least cocks that operate in the standard manner. As information, a specification has been prepared for devices intended to supplement electro-pneumatic brakes not otherwise protected in the event of circuit failure. It requires that the device produce an automatic brake application by the pneumatic system in the event of complete or partial electro-pneumatic failure.

The Committee has no objection to changes in the air brake rules complying with the ICC revision of Rule 208 (a) changing the cleaning time of locomotive control valves from six months to one year. The Committee on Geared Hand Brakes was given a suggestion that when dual AB-1-B brake equipment is replaced by a single equipment, the hand brake should have multiplying device or unlimited take-up.

Brake and Brake Equipment Approvals

The brake cylinder release valve developed by Crerar Adams & Co. meets specification requirements. General Committee approval was recommended for a limited application of Caco valves for service approval. Permission was granted for a number of brake piping installations on cars with Pullman Standard cushion underframes, but a change is necessary to reduce the length of

the branch pipe on future cars. Satisfactory tests have led to the recommendation that Dresser couplings be added to the table of fittings in Interchange Rule 101. The Garlock AB brake cylinder packing cup was favorably reported after a series of tests. There is no approval test in the packing cup specification and no further action could be taken. An improved combined dirt collector and cut-out cock was approved as an alternate standard and will be added to the Interchange Rules. It has better flow characteristics and an O-ring seal on the key.

A member road was advised that the limit on Inside brake cylinder diameter in the Manual is for both manufactured and and reclaimed cylinders, and should not be exceeded. Another road was told that the Committee felt there should be no rule change requiring a test-track test of AB valves in event of brake burns because an on-the-spot check with the single car test device should be better able to find the cause. RDC cars are entitled to extension of cleaning period for D-22 equipment because of the applicable ICC rules another member was advised.

Brake and Brake Equipment Investigations

Study and investigation of the Wabcoseal angle cock are continuing to determine performance. Preliminary investigation has been made of the AC brake equipment and work is going on with manufacturers to determine whether desirable features of this equipment could be made part of the AB portions. The location of the angle cock on equipment with Type F Tightlock couplers is still under investigation at the request of the ICC and with the aim of revising the Manual. Nine other items dealing with brakes and brake equipment are reported to be under investigation.

Discussion

The discussion strongly supported the proposal to increase from 6 to 12 months the maintenance interval on certain air brake items covered in Rule 208(a). One member said the equipment does not belong on a modern diesel if it won't go 12 months—that, after all, if the D22 equipment can go two years there is no reason that D24 can't go half that long.

Another question concerned the recommendation for the type cutout cock that should be used. The PRR has equipped all its locomotives with either brake-pipe end cocks or standard angle cocks to avoid errors from different handle positions and recommends this practice in the interest of safety and standardization. Part of the committee also felt this way, but the majority favored the proposal as written.

Ways to reduce hose coupling leakage were discussed, as this leakage comprises a majority of brake pipe leakage which is about two-thirds of the total leakage on a car. A cold weather test and closer control of the conditions of the coupling and the method of application of the gasket were felt to be helpful.

To Standardize Hand Brake Wheels

The engineering committee of the geared hand brake manufacturers has agreed to design a standard brake wheel to fit all makes of vertical wheel hand brakes made after a later date. The use of this wheel would reduce large inventories of many designs of wheels, permit use of same wheel on all new designed brakes and do away with many conflicting directions that appear on some wheels when used on brake units other than those for which they were manufactured. These wheels will be made of either malleable iron, cast steel or of pressed steel having a forged steel hub riveted thereto.

The 34 types of geared hand brakes to which AAR Certificates of Approval have been issued have been divided into two classes, active (29 brakes) and discontinued (5 brakes).

Two proposals were recommended for letter ballot action. The first would establish a standard length of brake chain (21 9/16 in. from line of lower attachment rivet hole in housing to center line of clevis rivet or bolt). The second would change the pull requirements of paragraph 5 (e) for reclaimed hand brakes from "2,000 to 3,000 lb" to "at least 3,925 lb," making this requirement the same as for new designs.

A cylindrical screw brake simulating that of an internal expansion type within a wheel drum was rejected as being too revolutionary and in need of too much development work to apply it to existing equipment.

Discussion

A question was raised concerning a revision calling for a 21 9/16-in. chain length because no tolerance limits were indicated, but no change was made in the language as it was considered primarily a locating dimension.

Lubrication of Cars and Locomotives

Under study are the increased use of grease for roller bearing lubrication and changes in seal types that have intensified the problem of leakage through the rear grease seal. Relubrication on a three year basis has been approved for the grease-lubricated cars of a member road after test, and other requests have been made. The committee added one new grease to the approved list, reported successful road tests of four others, and is preparing to test five more.

The three journal box lids submitted for approval during the year failed to meet specifications. The redesign of a fourth was tested and improved performance is reported. Members continued to make reports of journals damaged by spring type packing retainers. A recommendation was made to the Arbitration Committee that approval be withdrawn from six such devices, and that their mandatory removal be ordered. There have been no reports of damage by the modified spring type retainer. One "long" type spring packing retainer was approved, and a second retaining device was approved for limited interchange service.

Lubrication research has been facilitated by three new test machines installed at the mechanical laboratory during the year. The committee received an Armour report on the hot box problem, and laboratory reports on eight journal lubricators, on new waste saturation, and on a waste grab prevention device. The Armour report and another covering road tests of journal lubricators were submitted to members. Changes in the specifications for new and renovated journal box oils have been recommended. The viscosity of the oil would be changed from 80 to 100 to provide a lighter oil at low temperatures and a heavier oil at high temperatures.

The RS journal stop and packing retainer on a number of roads has been reported to be doing a good job. Satisfactory service on a Frisco car is reported in detail. Tests of the National Dust Deflector Housing indicate that the device has undesirable characteristics. Changes in the Lubrication Manual are planned to show how to handle the many recently developed journal lubricators, ventilated journal bearings, the flat bearing and wedge, and the RS journal stop. A preliminary draft of the manual section covering 14 journal lubricators is included in the report and summarized in this issue, page 56.

Discussion

The discussion also included a list of required characteristics for pad-type lubricators as seen by Miller. It was also pointed out that there are now about the same number of cars in service with lubricators as with roller bearings so that the economics of the two types of equipment can be evaluated.

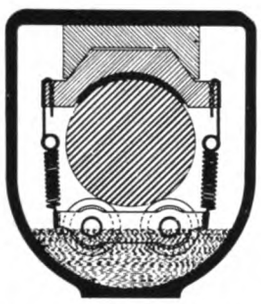
It was pointed out that the railroad industry is now paying $20 million a year to repack its two million freight cars, yet is being hampered by 128,000 set-out cars per year because of hot boxes—also that most operating men consider such deficiencies of loose waste as waste grabs and misplaced packing to be the cause of two-thirds of the hot boxes. If this contention be true, about 85,000 set-outs annually could be eliminated.

The saving from eliminating this many set-out cars plus the value of improved operation could go a long way toward paying for journal box improvements as they were being made and lead to substantial savings upon completion of such a program.

Lifting the lid on . . .

Journal Lubricating Devices

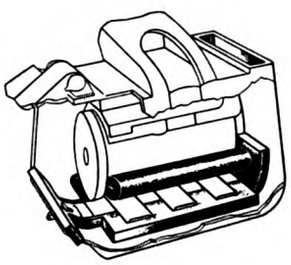
Behind yellow-painted journal box lids carmen are finding a growing number of special lubricating devices. AAR is putting instructions on 14 of them in the Lubrication Manual. They have approval for limited application after AAR tests. When they are installed, the type is stencilled on the side of the car. Only the Plypak uses conventional waste packing. All of them use AAR car oil for lubricant. Inspection is made for overheating and to see if the device has shifted out of position, but no "setting-up" with a packing iron is to be done. In event of failure, AAR says to hold device for instructions and apply conventional packing if no duplicate is available.



EMPIRE JOURNAL LUBRICATOR

Empire Journal Lubricator Co.
343 S. Dearborn street
Chicago 4.

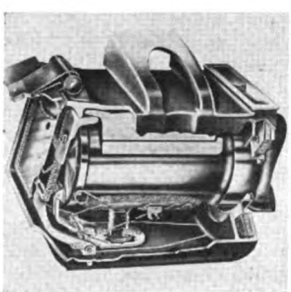
Two ball-bearing rollers held in contact with the bottom of the journal by four springs hooked through drilled holes in the journal bearing lugs feed oil with rotation of the journal. A special oil-seal dust guard is used. Oil level should be ½-in. below journal collar.



JEFFERS JOURNAL LUBRICATOR

Fullo Corporation
2610 Eastwood avenue
Chicago 25.

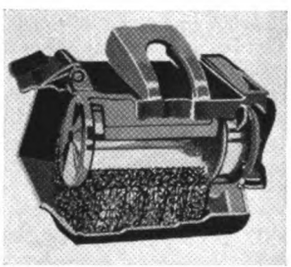
A silicon-impregnated wool-felt wick covers a tempered spring-steel frame to feed oil to the journal surface. Fillet oil seal and lid seal are built into the device and it is bolted to the box just under the lid opening. Oil level should be kept about 1-in. above box bottom.



HENNESSY JOURNAL LUBRICATOR

Hennessy Lubricator Co.
605 Guilford avenue
Chambersburg, Pa.

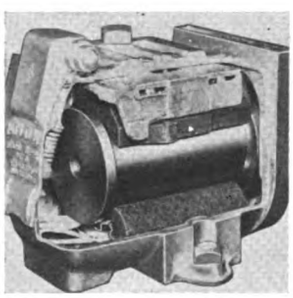
The pad-type oil distributor is fed by a pump actuated by the axle end movement while the car is running. Also used are a special oil-sealing dust guard and an inner lid seal. Gage mark on the lubricator frame shows the proper oil level—about 1-in. below the collar.



CHENILLE ROLL PACKING

Journal Box Servicing Corp.
1112 East Kessler Blvd.
Indianapolis 20.

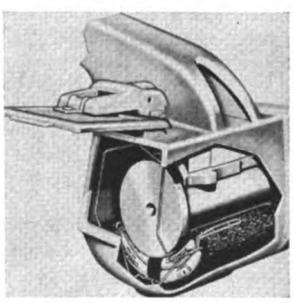
These are manufactured chenille packing rolls shaped and applied like waste rolls for journal box packing. Four rolls are used in 5 x 9-in. boxes, and five in the larger boxes. Lubrication is through wicking action. Oil level should be about 1-in. above the bottom.



STAPAX LUBRICATOR

Lubrication Products Co.
5606 Herman avenue
Cleveland 2.

A cylindrical shaped felt pad is formed around steel springs and has music wire or chain spiders built into it to prevent rolling. Lubrication is through wicking action. Oil level is to be kept about level with the top surface of the lower layer of the pad in the box.



MILLER JOURNAL LUBRICATOR

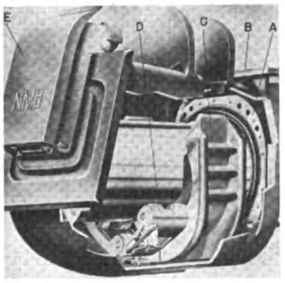
Miller Lubricator Co.
Winona, Minn.

A rectangular shaped cellular rubber core is enclosed in tough blanket-like material made of threads and wicking cloth. Contacting journal and box bottom, this blanket wicks oil to the journal surface. Oil level is to be kept about 1-in. below the journal collar.

CEL-O-PAK JOURNAL LUBRICATOR

O-Cel-O Division
General Mills, Inc.
1200 Niagara street
Buffalo 13.

These are semi-circular cellulose sponges shaped to fit the journal and box. Oil is fed to the journal surface through the sponge by wicking action. Two sponges are used for packing each box. Oil level is to be maintained about 1-in. above the bottom of the box.



NMB SEALED JOURNAL BOX KIT

Railway Equipment Division
National Motor Bearing Co.
Redwood City, Cal.

This assembly has a lubricant conveyor feeding oil from the bottom of the box to the journal as it rotates. A special sealing dust guard, special journal box lid, and guard bearings that limit axle end movement are included. Oil level should be ½-in. below the journal collar.

OPTIMUM JOURNAL LUBRICATOR

Railway Service & Supply Corp.
510 So. Harding Street
Indianapolis.

Lubricator has two steel retainers into which are fitted two lubricating rolls of special blanket material rolled and tied to shape and giving wicking action. Box lid has heat indicator that paints axle end yellow if overheated. Keep oil level about 1-in. above bottom of box.

ROLIN RAILROAD JOURNAL LUBRICATOR

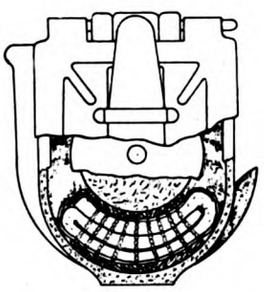
Runknagel and Nichols, Inc.
Room 2025, 165 Broadway
New York 6.

This lubricator consists of a lubricating pad held by a flexible cradle frame that has two spring clips holding the assembly in proper position. Lubrication comes from wicking action. Oil level should be at the red mark on the cradle frame—about ¾-in. above bottom.

SOCKELL SNUG-FIT JOURNAL LUBRICATOR

Seaboard Lubricator & Mfg. Co.
P. O. Box 10185
Raleigh, N. C.

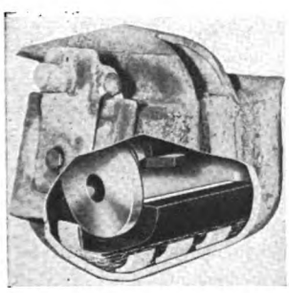
A spring-loaded yarn pad is held against the journal surface with six helical springs. Wicks extend from the pad to the bottom of the box and provide lubrication through wicking action. Oil level should be kept about 1½-in. from the bottom of the box.



UNI-PAK JOURNAL LUBRICATOR

Uni-Pak Corporation
P. O. Box 8302
Pittsburgh 18.

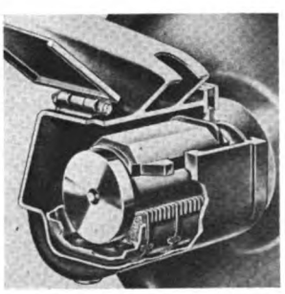
A foam-Neoprene body is sewed into a cotton container with special weave yarn looped through entire assembly to wick oil from the bottom of the box to the journal surface along its entire length. Oil level is to be maintained at about 1-in. above the bottom of the box.



EVER-PAC JOURNAL LUBRICATOR

United States Rubber Co.
4300 New Haven avenue
Ft. Wayne 4, Ind.

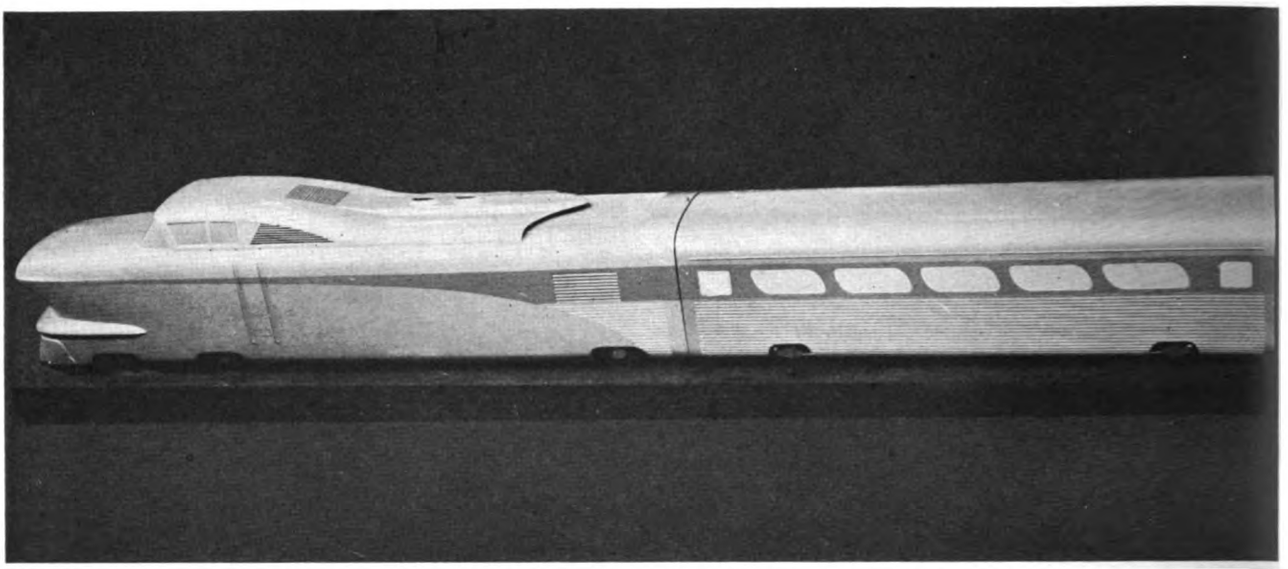
This lubricator has a body of synthetic sponge rubber holding a one-piece felt wick pad against the journal. Lubrication comes from wicking action. Oil level should be at the filler hole in the front of the rubber pad just under the journal collar.



PLYPAK PACKING CONTAINER

Waugh Equipment Co.
420 Lexington avenue
New York 17.

A synthetic-rubber container holding about 60 per cent as much standard waste as needed for the standard packed box, this device exerts proper pressure along journal to assure adequate lubrication. Oil level should be maintained about 1-in. below the journal collar.



Model indicates the relative size of the locomotive and the cars, and shows the single two-wheel idler axle which will sustain weight at the rear of the locomotive. One 12-567C GM diesel engine, mounted conventionally inside the 53-ft locomotive, will furnish 1,325 hp for traction. Current for train heating, lighting and air conditioning will be furnished by generators operated by two GM 6-110 Detroit diesel engines, also mounted within the locomotive body. Top of the cab will be 13 ft, 7 in. above rails. Some details may vary slightly in the final version of the train, which will be shown at the General Motors "Powerama," August 31 in Chicago.

GM Building Complete High Speed Train

New locomotive and new cars being turned out by GM divisions feature new concepts, but GM is not to become a car builder.

Harlow H. Curtice, president of General Motors Corporation, has revealed specific details of the lightweight, low-cost passenger train his corporation was known to have been building. He termed the train a "new concept" in railroad transportation. It will have a capacity of 400 passengers and will be able to operate at speeds over 100 mph for sustained stretches. It will be shown to the public sometime later this year and thereafter will be demonstrated on all major railroads, he said.

The train will consist of 10 coaches and a single 1,200-hp diesel-electric locomotive. It will cost less than $1,000 per seat when built in volume production. Mr. Curtice predicted.

Light Weight Cars

The car bodies will be comprised of steel carlines and purlines over which will be laid an exterior sheathing (above the floor) of anodized aluminum. Below floor level, the sheathing will be steel of a similar pattern.

Because the new type of car body is so low in first cost, it is expected, according to GM spokesmen, to prove more economical to discard a worn-out body and replace it with an entirely new body on the old underframe, than to put the old body through the present expensive practice of rebuilding.

The GM coaches will have a welded steel underframe, so designed as to carry strength out to the sides for maximum safety. A 3-in. space will separate the steel subflooring—an integral part of the frame—from the flooring in the passenger compartment of the cars.

Within this space will be 1 in. of dead air and 2 in. of Fiberglas insulation. The floor itself will be of $\frac{7}{8}$-in. exterior plywood, topped by a $\frac{1}{8}$-in. rubber mat. The seats will be bolted through this and direct to the steel subflooring.

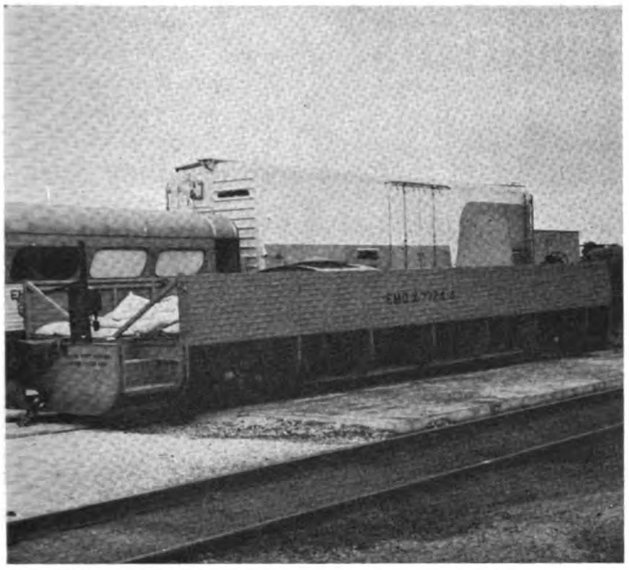
One end of each car will have a vestibule with entrances on both sides. Folding steps are designed to accommodate passengers at both high and low platforms. The other car end will contain a lavatory and an airplane type pantry able to serve up to 40 meals.

Baggage will be carried in compartments under car floors. Thus, while passengers will ride on a higher level, the center of gravity of the coaches will be 10 in. lower than in present railroad equipment.

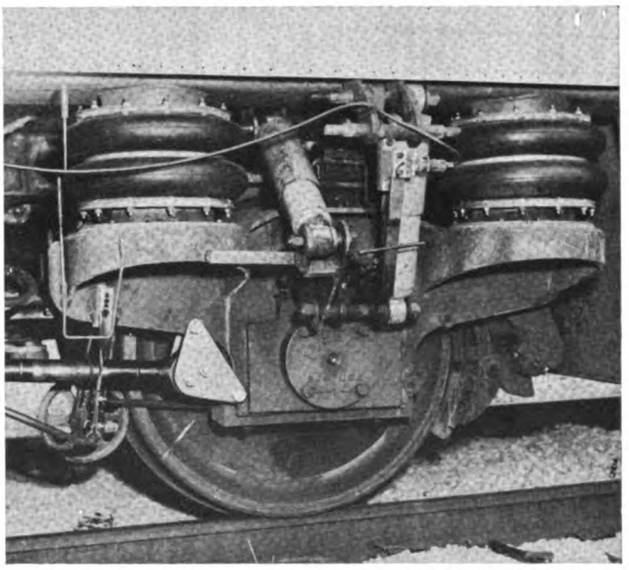
Exterior styling and interior decor have been worked out by the GM styling section. Strength and safety features will be "far in excess" of government and railroad requirements, Mr. Curtice said.

Air Springs

Cars of the new train are adapted from the body design of GM's Truck & Coach division's 40-passenger intercity type highway coach, but are widened 18 in. to give more seating space in the cars and a wider aisle. Like the high-



A sand-bagged test coach, (left) minus superstructure, shows bin-like construction in underframe. Compartments, from left to right, are for vestibule step, truck, air brake equipment, baggage (2), air conditioning equipment, truck and water storage tank. Attached beneath each tightlock coupler will be a box containing all connections needed for air, steam and electric lines. These connections will join automatically upon impact, thus eliminating the need for "coupling up" air and steam lines. Revolutionary truck (right) has single axle and bellows-type air suspension in lieu of conventional steel springs. This is but one of several types being tested by GM engineers; here, it is draped with wires, cables, etc., connected with recording instruments.



way coaches, the cars will have air, rather than spring, suspension and many of the suspension parts will be interchangeable with those used in standard "scenicruiser" highway buses.

The air suspension system will help insulate the coach body from noise and shock of steel wheels on steel rails. This system also aims to provide self-compensation for body variations due to load changes, centrifugal force on curves, etc., thereby providing a level ride. A separate air line from the locomotive feeds the system. An outside rubber cap pedestal mounted between the bellows will support the car body in the event of damage to the bellows or loss of air pressure for the suspension system. The shock absorbers are planned to help dampen lateral and vertical motion.

Because the locomotive will have a dynamic braking system, which GM expects will meet all requirements except holding the train stationary and for emergencies, the composition-shoe single brake on each car wheel will be so seldom used that, GM believes, it should last the life of the car.

Mr. Curtice explained that the train was designed to meet requirements set by a group of railroad presidents who asked car and locomotive builders to explore new ideas in equipment design to cut investment, reduce operating and maintenance costs, lower the center of gravity, increase average speed, improve riding comfort and help reduce the railroad passenger deficit.

Designed as Unit

The committee's challenge gave GM a chance to design an entire train as a unit, said Mr. Curtice. "Here, for the first time, was an opportunity to select the most economical prime mover and match it with a train to obtain the ultimate in utilization and economy," he explained. "The size of the diesel engine, the size of the auxiliary engines, the size and weight of the cars, for example, have been determined by the contribution each makes to the most successful whole, from the standpoint of performance, first cost, operating cost, maintenance, repair costs and safety," he said.

To the requirements of these railroad presidents, GM added one of its own—that existing, proved components should be used in the new train wherever feasible. Because these are already in mass production, this means economy, and because they have been long tested, it means reliability, he stated.

Thus, the new train will have standard GM diesel engines and Electro-Motive generators, traction motors and control apparatus. Car bodies, as stated, will be from GM's Truck & Coach division; air conditioning from GM's Frigidaire division; auxiliary diesel engines for train heating and air conditioning from the Detroit Diesel Engine division, and auxiliary generators from the General Motors Delco Products division, Mr. Curtice explained.

1,200 Hp Locomotive

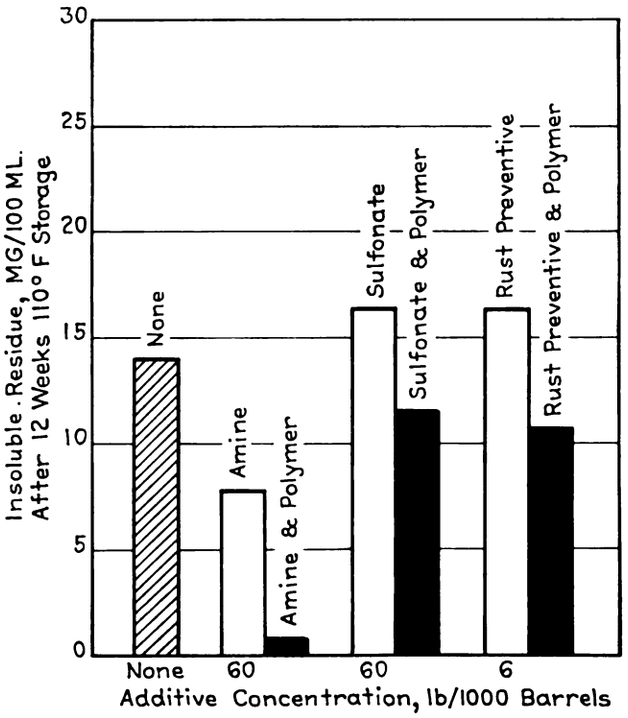
The locomotive will contain a single 12-cylinder GM diesel engine offering 1,200 hp for traction. Fuel consumption will be about 1.3 gal per mile at top speed with full load on level track. The lighter weight and lower center of gravity will permit faster average operating speeds than is possible with present streamlined equipment, Mr. Curtice predicted.

"General Motors has no intention of going into the railroad passenger car building business," he reiterated. "It is primarily interested in the promotion of the use of its diesel motive power and presents the new cars as a service to its customers in the hope that they may offer a solution to the passenger deficit problem."

The new train will be "even more startling" than the GM "Train of Tomorrow" built several years ago, he added.

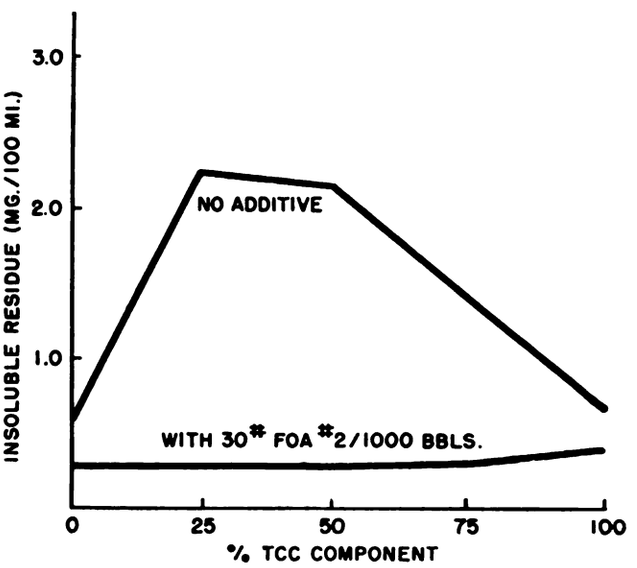
Will Your Fuel Oil Have Additives?

What additives do for diesel fuel oils and how they work. Railroads and refiners have a big stake in these answers.



Mixtures of additives in one fuel oil always showed a reduction of residue formation compared with that formed in the presence of a single additive. However, this was not only the mixture but a stronger concentration as 20 lb per 1,000 bbl of polymer was added.

Summarized here is a discussion that was held during the Corrosion Conference sponsored by the International Nickel Company at Wrightsville Beach, N. C., on May 10, 1955. Illustrations are from E. I. DuPont de Nemours & Company



Mixture of straight-run oil with Thermofor catalytic-cracked (TCC) oil. When 100 per cent of either of these was used, there was considerably less residue than when they were mixed. Addition of an additive reduced the amount of residue over the entire range.

What are fuel oil additives?

Additives are chemical compounds that are added to fuel oils to improve diesel engine performance and economy of operation. Additive-treated low-cost fuels are in some cases found to have a higher BTU rating than conventional fuels, and have reduced fuel consumption while maintaining the same engine horsepower output. There are some fuel oils, however, which will not respond to additive treatment and each fuel must be investigated separately.

•

What are the meanings of "economy," "low-cost," "distillate," and "residual" when applied to fuel oils?

"Economy" is a refiners' term and "low-cost" is a railroad term and probably both mean anything that costs less than what is being used now. "Distillate" is that part of a crude that is removed over a fractionating column and is typified by a full distillation range. Formerly only heating was used to do this, but to get greater yields from crude, there are many installations of catalytic cracking units used now. In these a combination of heat and the presence of a catalyst causes portions of the oil that formerly would have been high-boiling to break down and produce still more lower-boiling distillate.

A "residual" fuel is one that is a bottom product from the fractionating column and generally has a greater amount of carbon residue, ash and salts. ASTM has a viscosity classification which causes some mix-up because a distillate can have the same viscosity as a residual fuel, but would not contain as much carbon residue, ash and salts.

•

How are improved performance and greater economy achieved with additives?

Additives can function in one or more of six ways. They can increase stability which means slowing the formation of insoluble residue in fuels and breaking up that residue which has already formed. This prevents sludging in storage tanks, and the plugging of filters in the fuel handling equipment and on the locomotive.

Additives can prevent injector sticking. Cetane rating can be increased. Improved combustion can decrease fuel consumption and smoke production. Corrosion can be reduced by using the proper additives. They can also lower the pour point of fuels.

•

Which of these reasons is most important?

This is changing rapidly, but slowing and breaking up residue formation is probably most important. The fuels supplied today are not the same as the straight-run fuels formerly sold because they do not have the same stability. The complex molecules that broke down in the presence of the catalyst have a tendency to regroup into large molecules again. Cetane rating measures the time lag between injection and the start of combustion. Higher cetane rating means a shorter lag. However, today the trend is toward lower rather than higher cetane ratings. With the increased interest in lower grade fuels, additives are increasingly attractive because improved combustion can mean less smoke and reduced danger of sparking that might start fires. Corrosion is due to the water and water soluble elements contained in the fuel. Standard additives act only on that portion of the fuel which is oil. A water-soluble inhibitor is the answer to corrosion problems. Lowering the pour point primarily increases the ease with which fuel is handled in cold weather. As more lower grade fuels are used, this is increasingly important.

Is there a single additive capable of doing all these jobs?

No. Some additives may be effective in several categories. The greatest progress has been made in dispersing insolube residues and the least in improving combustion.

•

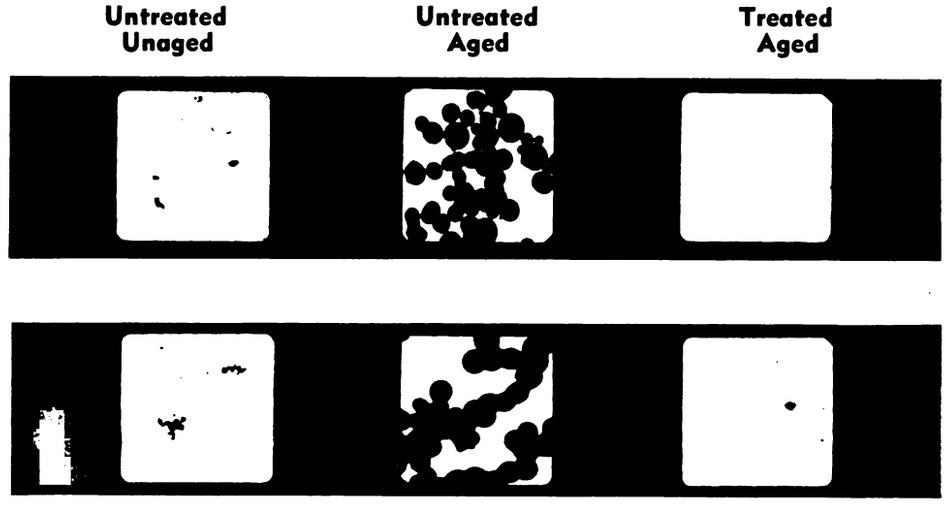
Can "how additives work" really be explained?

Yes. Analysis of residue on filters and varnish on injectors shows that insoluble chemical compounds are formed by reactions between the non-hydrocarbon constituents in the fuel, such as oxygen, sulfur, and nitrogen. Additives are developed to react with the oxygen, sulfur, and nitrogen before they have a chance to react with each other. In addition to preventing chemical action, when the additive reacts with one of these elements, the additive is so soluble in oil that it keeps the material dispersed even after combining with it.

This has been verified in work with the electron microscope. However, it appears that there is need for standardization of these tests and a definite method of rating.

The electron microscope is a most important tool for studying dispersion, but it is only what the user makes of it. Interpretation, sampling, and technique are of prime importance. Some work has been done on correlating conventional light microscope rating with that obtained by the electron microscope.

Close-up on Performance of Fuel Oil Additives



Action of stability additive in a fuel oil prevents the development of an insoluble residue of large molecules that can plug fuel filters and cause injectors to stick. Electron microscope makes possible these photographs which are 4,100 times actual size. The mixture of fuel oils developed the worst condition of sludging if uninhibited, but with proper additive treatment neither sample would give unsatisfactory engine performance. Bureau of Mines work has shown that 12 to 13 weeks storage at 110 F causes same deterioration as one year of normal storage. The 12-week specimens were "heat-aged" to show what their condition would be after a year in a storage tank.

MORE ON NEXT PAGE ▶

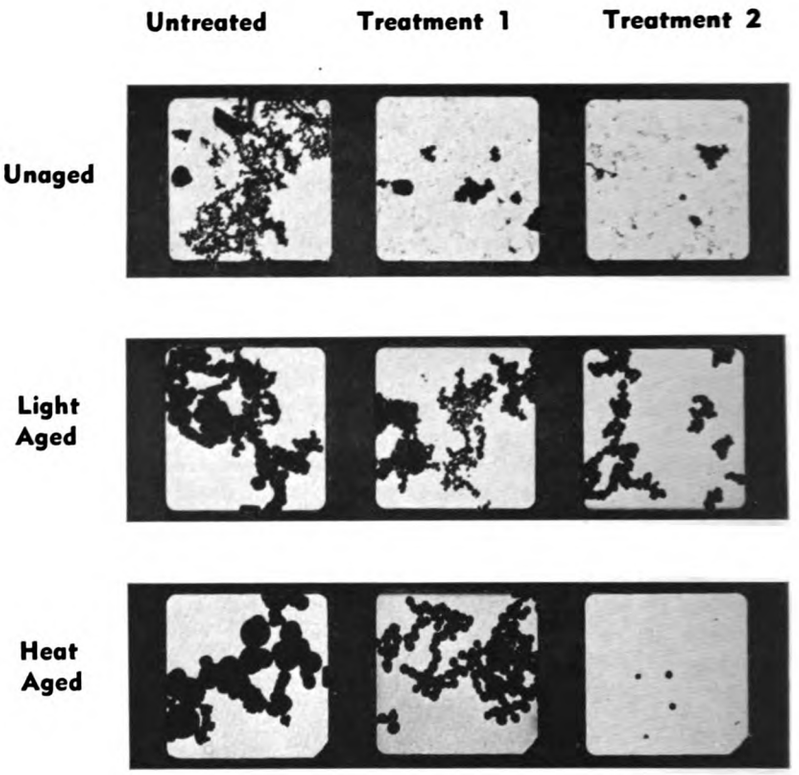
Electron Microscope – Developing

What's It Tell?

In an attempt to develop a method of rapid aging, both the heat-aging previously described and a method that places a sample in a window where it is aged by light have been tried. Treatment 1 used 77 lb per 1,000 bbl of one type additive. Treatment 2 used 40 lb per 1,000 bbl of a second kind. In the photomicrographs of the light-aged fuel every specimen looks bad. Both the untreated and the Treatment 1 fuel did perform unsatisfactorily in the engine. However, the Treatment 2 fuel performed better than the premium fuel.

Heat aging this same fuel duplicates what was shown in engine performance—that the Treatment 2 fuels actually is excellent for diesel service. Better interpretation of electron microscope findings is essential to evaluate fuels properly.

All photographs are 4,100 times actual size.



How are additives classified chemically?

The stability additives which have been rated as most important at the present time are divided into three chemical types—polymers with basic maino-nitrogen groups, petroleum sulfonates which contain a metal such as odium or barium, and also highly alkyl surface-active amines.

•

What concentrations of these additives are effective?

For the stability additives just classified, the following concentrations are typical:

	Lb per 1,000 Bbl.	Pints per 1,000 Gal.
Polymers	10 to 60	0.3 to 1.5
Sulfonates	50 to 150	1.2 to 3.6
Alkyl amines	15 to 75	0.4 to 2.0

•

How should additives be put into fuel oils?

Generally speaking it is most effective and economical to add them at the refinery before the fuel begins to deteriorate. Lower concentrations can do the job when the fuel is fresh. However, a jobber or user can put them in. While a refinery should be in a good position to know what additive is needed, in some cases a railroad may have a special problem that is best solved locally.

If fuel oils from different sources are mixed in storage tanks, the effectiveness of the additive may be minimized and may not prevent sludging.

•

Does long storage affect the stability of additive-treated fuels?

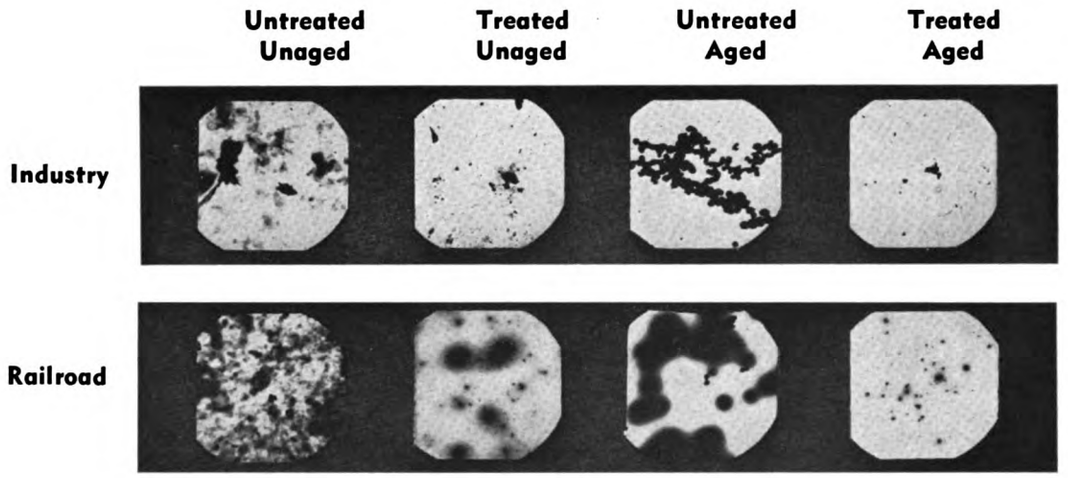
Tests indicate that higher concentrations of additive increase the storage stability, although this varies with each fuel. However, usually a minimum of additive is used. Higher temperatures in the South accelerate this deterioration. Storage over water, and the metal walls of storage tanks have been considered in devoloping additives.

•

Can fuel oils with different additives be mixed without bad effects?

Indications are that the incompatibility of fuels and not of the additives is most important. Tests have shown that mixtures of additives in oils always served to further reduce the amount of insolube residue. However, when oils from two sources are mixed, greater amounts

As A Tool for Fuel Oil Research



How's It Done?

Technique of taking electron microscope photo-micrographs is illustrated in a series made by Denver & Rio Grande Western Railroad technique and by DuPont technique of the same fuel oil. The unaged and untreated fuel was suspected of causing injector sticking and was classified by the micrographs as a borderline fuel. Additive treatments were quite effective in dispersing residue in the unaged fuel. After light-aging the fuel would be considered poor in the uninhibited condition. However, without storage and without treatment this fuel oi operated satisfactorily in locomotive service and did not cause any injector sticking. Comparison of techniques in the inhibited samples was fair and indicates the need for standardization of methods of examination and a concrete method of rating. All photographs are 4,100 times actual size.

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of residue developed than are present in either of the oils alone.

•

Are special equipment or extra precautions needed to burn treated oils?

Generally conventional lower-cost distillate fuels do not require any special equipment. Preheating is desirable with residual type fuels to increase the ease of handling.

However, additives have been developed which have been operating with fuel temperatures up to 700 F, so preheating should not destroy their effectiveness.

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Does preheating of additive fuel oils aid in their burning?

It is not required to aid any chemical reaction that occurs during burning. However, high-pour point oils and residuals can be more readily pumped if their viscosity has been lowered by pre-heating.

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Do additives present any safety or health hazard?

Present stability additives are no more toxic than the fuels in which they are used. In the future this may change and all additives should be handled with care.

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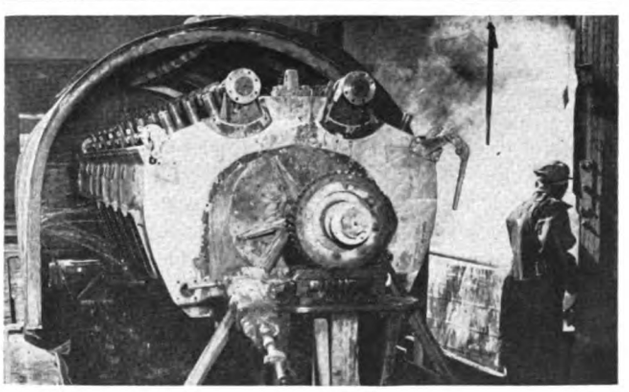
Is there a test to tell if a fuel oil is additive-treated and to identify the additive?

No. A spectographic analysis may identify metals that are contained in the sulfonate type additives. There are specific tests for determining some of the other types of additives, but an indication of what might be expected is necessary before such a test can be made.



A new type diesel engine cleaner developed at the Union Pacific's shops in Portland, Oregon, cleans and rinses crankcase assemblies in 30 minutes—a job that used to take one man 8 hours with a hand-operated steam cleaner.

Aluminum Pistons— A New Approach

This metal has weight and thermal conductivity that are fine for diesel engines, but it softens when heated. For successful pistons it requires special treatment.

By C. G. A. ROSEN

The two materials usually selected for diesel engine pistons are cast iron or aluminum alloy. A designer chooses aluminum for piston construction because of two outstanding properties it provides in an internal combustion engine. First, aluminum is light in weight. For equal sections, cast iron is 2.75 times as heavy as alunimum. In higher speed diesel engines it is essential to hold down inertia forces in order to lengthen the life of bearings and connecting rod bolts, and to reduce piston skirt friction. Aluminum alloys best satisfy these requirements.

The second advantage of using aluminum alloys for pistons is its very high rate of heat conductivity. Aluminum has 4.25 times the conductivity of cast iron. The ability of the piston to transfer heat from the crown above which the fire is built down to the skirt where it is transmitted to the cylinder wall is very important. High heat conductivity and low weight are the two important characteristics of aluminum-alloy diesel-engine pistons.

The most serious problem associated with the aluminum-alloy piston is the life of the top ring groove. This top groove serves as a valve seat for the ring. The ring and ring groove form a valve and seat that prevent the passage of the hot gases from the combustion zone down into the crankcase through the labyrinth of rings and past the skirt of the piston (Fig. 2). As a valve, the ring has two critical surfaces. One is the seat on the lower surface of the ring groove and the other is that between the piston ring and the cylinder wall. The pressure gradients are illustrated under conditions when both are sealing properly.

If the top ring loses either seat, the high temperature

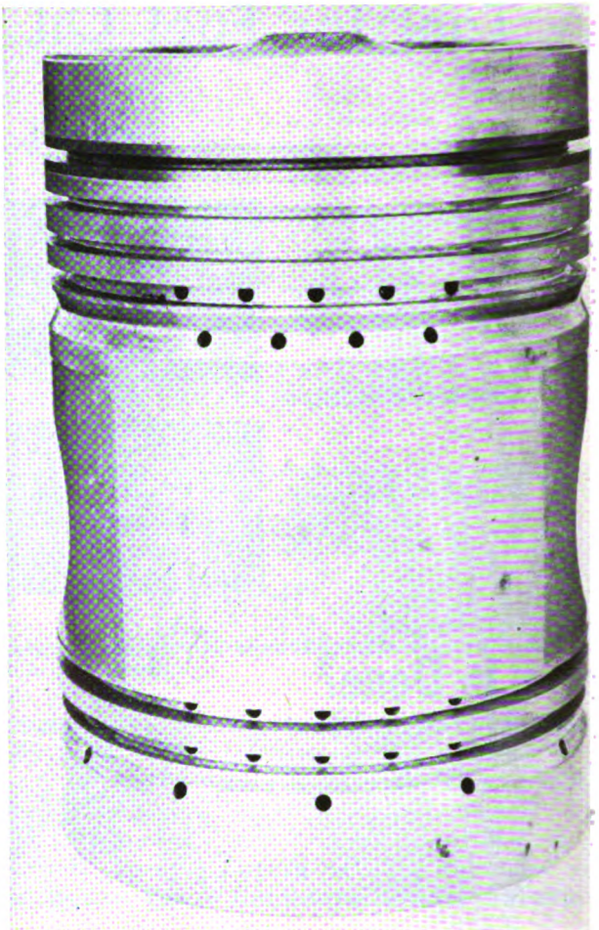


Figure 1. With a stainless-steel reinforced top ring groove applied by the Darcey process this piston has seen 500,000 miles of locomotive service.

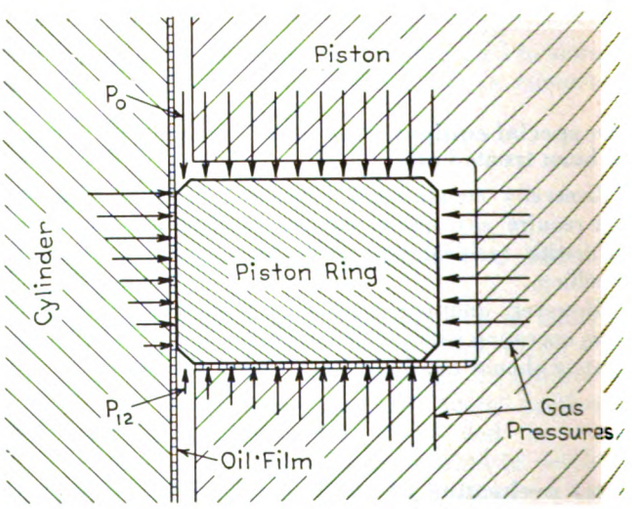


Figure 2. Piston ring seating properly on the cylinder wall and ring groove shows this pressure distribution.

This paper was presented at the AAR Mechanical Convention in Montreal on June 23, 1955. Mr. Rosen is a consulting engineer for the Caterpillar Tractor Company, Peoria, Ill.

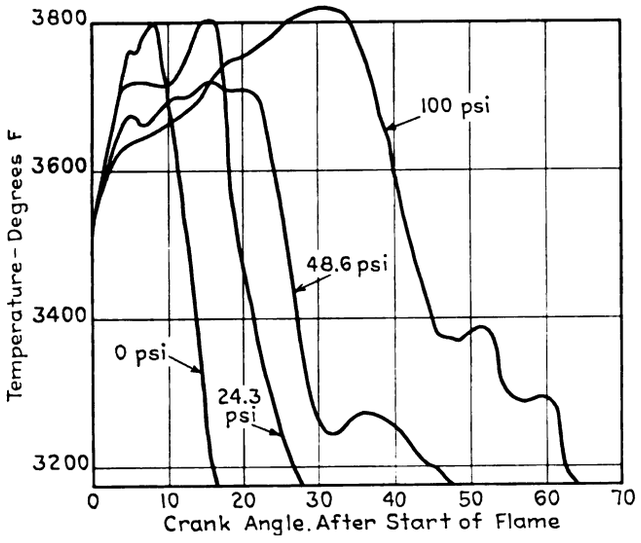


Figure 3. Changes in the combustion process which increase brake mean effective pressure expose piston to longer periods of high temperature.

gases (Po), sometimes as hot as 3800 F, sweep down and act as a torch in burning out the piston metal next to the narrow clearance space between the piston and the cylinder wall. When this occurs, the piston fails because of burned-out ring grooves.

Ring Groove Deterioration

What are the forces influencing piston and ring groove deterioration? The combustion gases are very hot. They have this high temperature for considerable periods of time which vary with the combustion process (Figure 3). Fuels have an effect on these temperatures. After-burning, which occurs in some diesel engines because of certain fuels, affects the amount of heat absorbed by the piston and the length of time during which that heat has a deteriorating influence. For both aluminum and cast iron pistons, the temperature gradient is very steep in the ring groove area, but flattens considerably as heat is extracted form the skirt by the cylinder wall. In diesel engines, aluminum piston crown temperatures range from 575 F down to 400 F depending on the design and combustion system. In the combustion zone, temperatures can be as high as 750 F at the center of the piston. The influence of the combustion process is quite evident on the temperature gradients prevailing in the piston itself.

The effect of repeated heating from the combustion process, or the combined influence of temperature and time on the hardness of an aluminum alloy locomotive piston is revealed in Fig. 4. This piston which had operated in a locomotive was checked for hardness around the top ring groove. The original metal had a hardness between 110 and 220 Brinell. This had softened above the top groove to 49 Brinell. Referring to Fig. 5, a special alloy was tested and the rate of softening with respect to temperature and time was determined. It can be seen that temperatures of 550 F acting on the ring zone for 2,000 hours can soften aluminum from 115 Brinell down to about 37 Brinell. Probably the piston with a 49 Brinell was softened by a temperature of 485 F in the ring groove section. It is far too soft for the ring to maintain a suitable surface on the groove and preserve

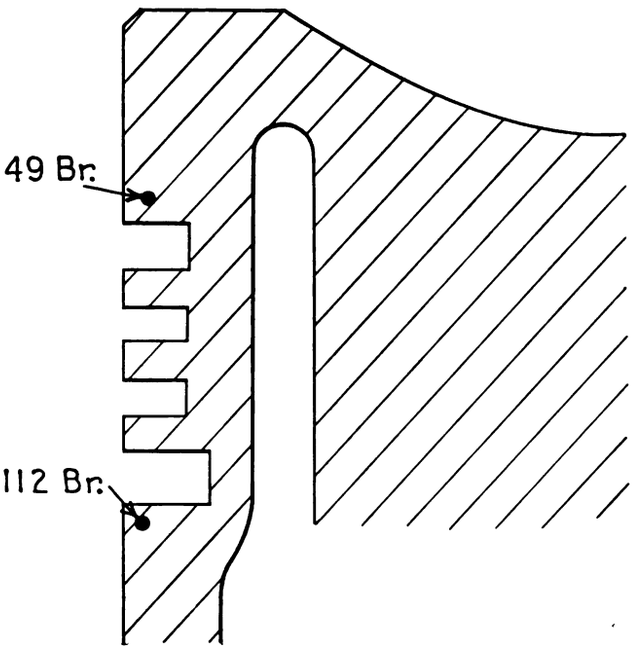


Figure 4. After service in a locomotive, this piston with an original hardness up to 220 Brinell had softened as shown.

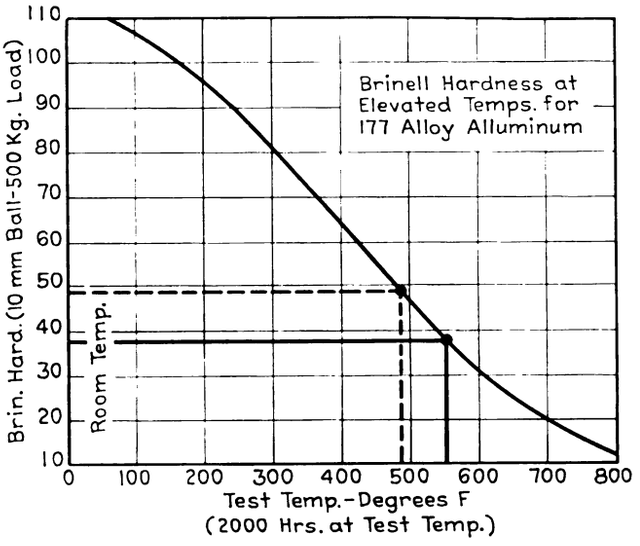


Figure 5. Laboratory test shows that the higher the temperature to which aluminum is exposed, the softer it will become.

a proper seal. When the aluminum is softened to the extent revealed in this piston, it is easy to understand how the top ring groove can fail.

Assumes Tapered Form

By setting up a used piston on a surface plate and determining the form of the groove with a surface gauge after several thousand hours of operation, it will be found that the groove has assumed a tapered form. The lower and upper surfaces of the ring groove have a very wavy profile. It is simple to understand how leakage and blow-by can occur in such a groove because the valve seat has been lost. Before such drastic failure occurs, the ring will beat out the ring groove so that the valve seat begins to lose its sealing ability. The loss

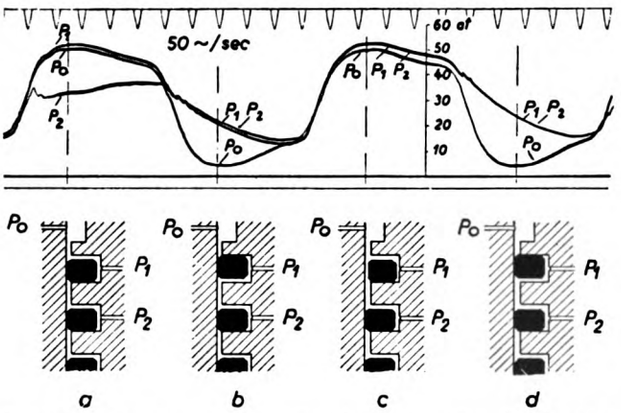


Figure 6. Pressure variations during the strokes of a diesel engine cause rings to move in the grooves.

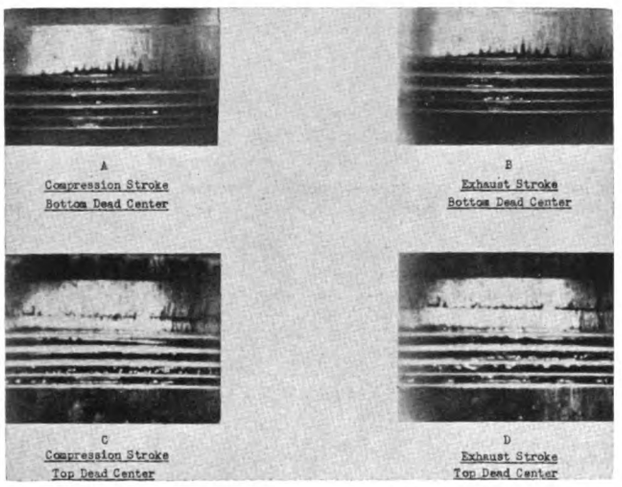


Figure 7. Glass cylinder in a diesel engine made it possible to take these photographs showing lubricating oil distrubution.

of seal not only permits the passage of blow-by gases, but also ruins the oil control of that particular piston. Particularly in the 4-cycle engine, the top piston ring is the most important for controlling oil consumption. When the seating of this ring in its groove is impaired, oil consumption starts increasing and oil rings have little effect. Primarily the oil rings act as scrapers for removing surplus oil from the cylinder walls and do not control lubricating oil consumption.

The tightness of the ring seal and the ability of the piston skirt to carry heat away through the cylinder walls are determining factors in the length of time the top ring can maintain its seat in the groove. If the piston and rings are effective channels for carrying heat into the jacket, the ring groove life will be lengthened. Tests have indicated how important heat transfer through the skirt can be in maintaining the life of the top ring groove. A trunk piston was fitted to a cross-head type engine. The skirt no longer served to transfer heat from the crown of the piston to the jacket. The piston reciprocated loosely in the bore and had no side thrust. With no side thrust, the surface of the piston did not rub against the cylinder wall with sufficient pressure to be an effective means of transferring heat. Under this condition, the top ring groove temperature reached 545 F. When the piston was installed in a normal engine the side thrust from the connecting rod reduced the top ring groove temperature to 460 F. In another test a piston with a cam ground skirt was fitted very closely to the bore. The low clearance provided a very efficient means of heat transfer. Under this condition the temperature of the top ring groove dropped to 360 F. This is important when considering the influence of repeated heating on the softening of the aluminum at the top ring groove.

Forces Acting to Cause Ring Groove Wear

To understand the dynamic forces acting on a piston ring that cause it to flutter or to impact the groove refer to Fig. 6. This shows a diagram of pressures acting on the rings in different positions and indicates the forces which can move the ring in its groove. In diagram A the rings are shown in the position which they occupy at the top center after the piston has come up on the compression stroke. The cylinder gas pressure indicated as P_0 has access to the top ring groove and is nearly equal to P_1 because the compression and the early stages of combustion influence the gas pressure behind the ring. P_2 is the pressure behind the second ring and is the same through the space between the lower edge of the top ring and the lower face of the second ring. This usually amounts to about half the cylinder gas pressure P_0. If P_0 is around 800 or 900 psi, P_2 would be around 400 to 450 psi. As the piston moves downward on its stroke and approaches position B, bottom dead center, P_0 and P_1 drop during the expansion until pressure P_2 is the same as P_1. From this point downward, P_0 continues to drop, and the gas trapped in the space P_2 becomes higher than P_0. The pressure of 400 psi or more in space P_2 causes the ring to lift and slams the top ring against the groove. If the aluminum has been softened by repeated heating it is easy to see how the ring will swage out the groove.

The sulphur content of the fuel has a decided influence on cylinder wear. Cylinder wear makes it more difficult for the ring to seal properly. If the ring must follow a tapered or out of round bore caused by high sulphur corrosion, the ring groove will be worn by the movement between the ring and the groove. Ash content in a fuel has its influence. Here again a direct abrasive action between the ring and groove and the ring and wall ultimately upsets the ideal ring sealing capacity. Materials must be selected for rings and for the piston ring groove which will resist wear caused by impact, by temperature, by friction and by abrasion.

There is also the problem of oil distribution in the ring belt and in the upper recesses of the piston ring travel. This is illustrated by photographs in Fig. 7 which were taken of an operating engine fitted with a glass cylinder. The photographs suggest the function of rings in oil distribution. There is an ample supply of lubricant at bottom dead center, but very little at top center. At all times only a small amount of oil seems to have worked above the top ring. Whatever oil is available is located on the bottom half of the land on the upward stroke. The largest amount of clean area on the upper part of the land occurs during the exhaust stroke. On the down stroke of the piston, oil covers the entire first land. The oil is delivered immediately to the first land at the beginning of the intake stroke. There is no apparent horizontal motion of the oil trapped on this land.

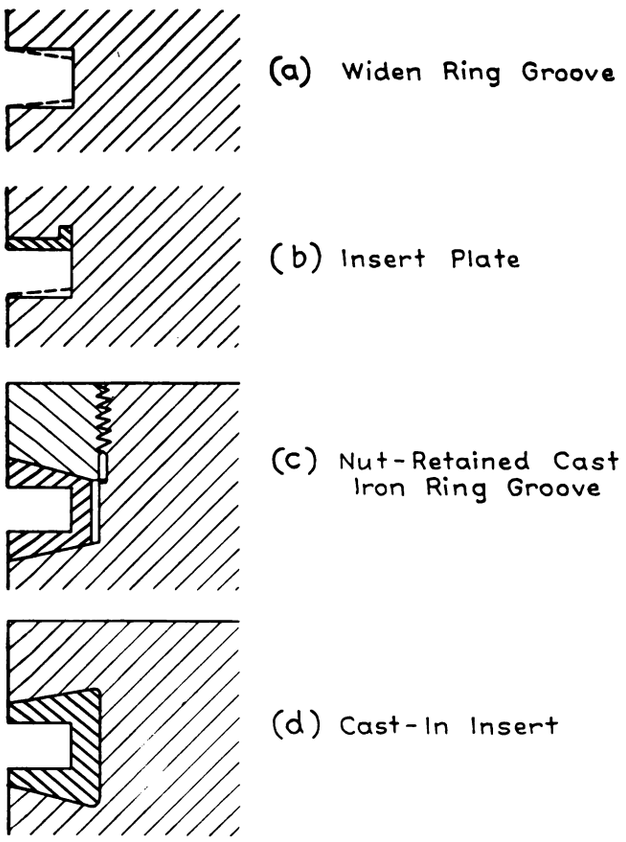


Figure 8. Four solutions to the problem of reinforcing the top ring groove of an aluminum piston.

Oil covers the second land in the following manner: on the exhaust stroke the lower two-thirds is covered with oil; on the intake stroke the land is entirely covered with oil; on the compression stroke the lower two-thirds is covered with oil; on the power stroke the land is entirely covered with oil. Oil located in the second land has a slight motion from right to left at top center on the compression stroke. The oil appears to remain stationary on all of the other strokes.

Piston Design

This situation in aluminum pistons could cause one to speculate on what might be accomplished to achieve the perfect piston with all of the characteristics which should provide maximum performance and life. An ideal piston would be one which would have an aluminum skirt and a ring band section approaching the hardness of cast iron. A ring carrier section could be made of cast iron or hardened stainless steel. Stainless steel has wear resisting properties which, would prove highly advantageous if used for the whole ring band section. The crown of the piston should be made of stainless steel or some heat resisting metal to withstand the desired temperatures in the combustion chamber envelope. Such a piston, however, would be extremely expensive, would be very heavy, and create high inertia forces, and would be commercially uneconomical.

The best compromise for a piston would be to provide the top ring groove with a surface which is sufficiently hard to withstand the wear and impact of the top ring and still preserve smoothness of surface. The ring can then function properly by expanding and contracting in its groove in relation to cylinder bore distortion and to the gas pressures exerted behind the ring.

What methods have been attemped to cure this problem? Fig. 14 shows four methods which have come into use. Fig. 8a shows the simple expedient of widening the top ring groove and installing a wider piston ring in it. This, however, does not solve the problem of the softened aluminum in the seat against which the piston ring must ride. Also, the geometry of the ring has changed, and the wider the ring in the top ring groove, the greater the danger of scuffing. Scuffing seems to be initiated from the center of the ring outward, and the wider ring is more vulnerable to it.

As shown in Fig. 8b, some pistons have been provided with an insert plate which is sprung into the top groove after undercutting it. This locks the insert plate in position. This method reinforces the top surface of the ring groove but does not solve the problem of softened material at the bottom of the groove. Some of this must be removed in order to install a new ring.

In Fig. 8c a cast iron or ni-resist ring is held in place by a nut forming part of the piston crown itself. The problems of expansion and contraction make this setup short-lived. It is an improvement and can justify itself in some cases, but in addition to short life, it is not capable of withstanding the severest type of service where expansions are beyond normal limits. In Fig. 8d is shown a very common method using a cast-in insert made of ni-resist or of cast iron. The insert is coated with a suitable material such as aluminum or zinc and following heating is placed in a mold after which the aluminum is poured around it.

The Darcey Process

In Fig. 9 is shown the Darcey metal spray process that provides a stainless steel surface in the top ring groove which can be hardened. In order to anchor and retain

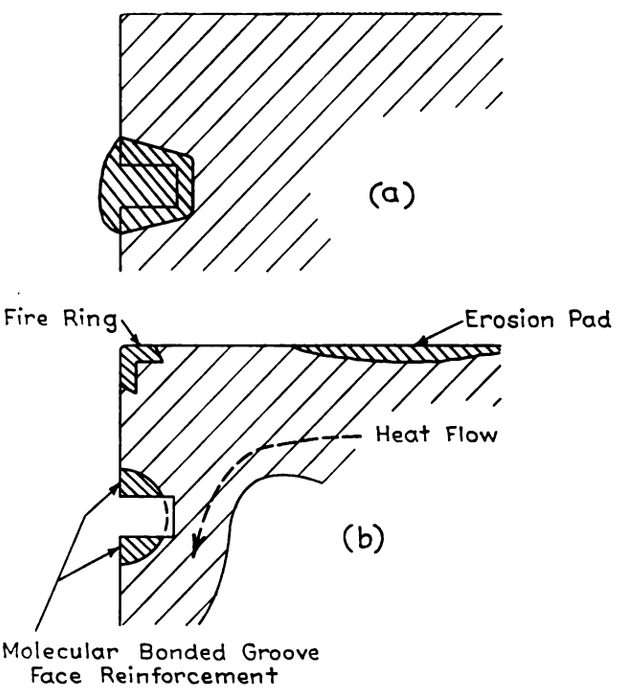


Figure 9. Darcey process can provide hardened wear surfaces without inserts or complicated machining.

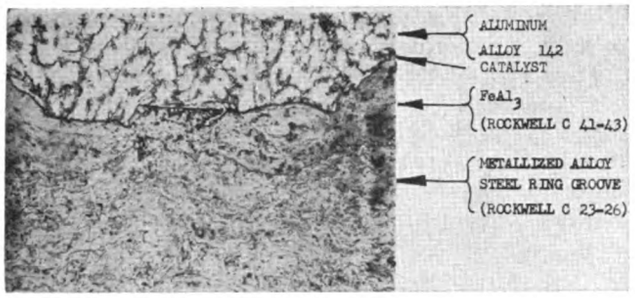


Figure 10. Bond produced between aluminum and stainless steel by the Darcey process is shown by this photomicrograph.

such a surface it is essential that there be a molecular bond between the stainless steel and aluminum. It is well-known that to provide a molecular bond between two dissimilar materials it is essential that there be a high degree of molecular activity when the two metals are brought together. They become firmly bonded by dispersion of the steel molecules among the molecules of aluminum and vice-versa. In the Darcey process the temperature at the surface of the aluminum is raised to such high values instantaneously that the aluminum is (vaponized.) At this time a catalyst surface is applied which makes a molecular bonding so complete there can be no separation of the catalyst and the aluminum. Similarly a deposit of stainless steel is made over the catalytic film. The aluminum and steel form a unified material and under pressure and temperature act as one element.

The character of the bond makes it possible to correct a number of piston problems. For instance, the edge of the piston crown can be reinforced by a fire ring. This is of great advantage in two-cycle engines because this edge uncovers either exhaust or air intake ports. It does preserve the edge and makes the piston a more accurate timing valve. Molecular bonding makes it possible to deposit stainless steel in locations where groove wear is heaviest. There is no need for depositing wear resisting material in the back of the groove. The edge closest to the cylinder wall has the highest bearing pressure, and a secure bond makes possible the ring groove shown in Fig. 9b. In some pistons, combustion-process erosion on the top of the piston crown can be offset in by the deposit of an erosion-resistant pad.

The stainless steel used is a special composition having expansion characteristics very similar to aluminum. In its molten stage it reacts with the aluminum through the action of the fluxing catalyst. The control sequence of the process governs the dispersion of the steel into the aluminum as shown in Fig. 10. At 75 magnifications it can be seen that a molecular bonding has taken place. In the process temperature control yields a steel that can be machined but still has a surface which will be highly wear resistant. The method involves no static casting or plating techniques.

The experience gained in over four years of experimental work indicates considerable value in salvaging pistons as well as providing new long-lived pistons. In Fig. 1 a piston is shown which has operated over 500,000 miles.

The ring groove wear is so slight that it is impossible to predict the time at which this piston will require changing. Undoubtedly the piston will be replaced because of some other type of failure.

Decisions of Arbitration Cases

Car Damaged By Train Parting and Running Together

The rear of a freight train ran into the front part after a broken knuckle at the back of the 100th car caused the parting of a 116-car Gulf, Mobile & Ohio train near Burkville, Ill., on June 4, 1953. The 101st car, Chicago & Eastern Illinois hopper 89260 loaded with iron ore, was badly damaged with repairs estimated to cost $3,000. The center sill broke back of the bolster and was shoved toward the middle of the car. The C&EI claimed that this was a collision under Interchange Rule 32, paragraphs 10(c) and 10(d), and that the handling line was responsible. It was said that the train was made up with loads at the rear and empties at the front causing unequal braking, and that the locomotive had no trainline flow indicator which would have shown the parting. It was mutually agreed that damage to the center sill exceeded that specified in Interchange Rule 44, but the damage resulted from fair usage according to the GM&O. Because there was no unusual handling enroute, no derailment, and air was not applied from the rear end, no Rule 32 conditions were involved. Instead the GM&O stated that Rule 120 was applicable, making the damage the owner's responsibility.

On October 14, 1954, the Arbitration Committee decision sustained the contention of the GM&O that there was no evidence that the car had been subjected to any unfair conditions specified by Rule 32.—*Case 1846, Chicago & Eastern Illinois vs. Gulf, Mobile & Ohio.*

Responsibility for Car Damaged by Fire

On December 9, 1952, Fruit Growers Express refrigerator car 59782 was discovered on fire enroute over the Seaboard Air Line near Withla, Fla. The car was set out, the fire extinguished, and damage was found to total $1,262.53. The car had traveled about 35 miles after being loaded with oranges at Lake Whales, Fla. The fire resulted from failure of a bearing on the Preco air circulating fan in the B end of the car. Drive for this fan is a rubber tire on a wheel of the car with the remainder of the belt-driven fan mechanism located inside the car body. The fan had been inspected by FGE forces prior to loading. The Seaboard contended that because the fan is not maintained or serviced by railroads, and because its concealment prevents any inspection, the responsibility for all the damage was that of the owner, Fruit Growers Express. In this the car would not come under Interchange Rule 32, Paragraph 10(k). The Fruit Growers said that they do not maintain fans after the car goes to a railroad, and under Interchange Rule 1, paragraph (a), "Each railroad is responsible for the conditions of all cars on its line, and must give all equal care as to inspection and lubrication."

Decision by the Arbitration Committee on April 28, 1955, ruled that the car owner was responsible for all damage to the fan arrangement, and the railroad was responsible for all resultant fire damage to the car. Decision 1704 is applicable to this case the Committee stated.—*Case 1847, Fruit Growers Express vs. Seaboard Air Line.*

Programs of Coordinated Mechanical Associations

HOTEL SHERMAN, CHICAGO

September 12, 13 and 14

Exhibit

Tuesday afternoon, September 13, has been set aside for the inspection of the mechanical products on exhibit at the Hotel Sherman under the auspices of the Allied Railway Supply Association, of which D. F. Hall (Hunt-Spiller) is president and C. F. Weil is secretary-treasurer. This period will also afford an opportunity to visit the Machine Tool Show.

Coordinating Committee Officers

The officers of the Committee of the Coordinated Associations which consists of the presidents and secretaries of the railway associations and the exhibiting organization, are: Chairman, J. P. Morris, general manager, mechanical department, Santa Fe; J. O. Welsch, general superintendent motive power, ICen; J. L. Robson, chief mechanical officer, GN, and Secretary C. F. Weil.

Allied Railway Supply Association

TUESDAY, SEPTEMBER 13

Presidents Luncheon

Speaker: William M. Keller, executive vice-chairman and director of research, AAR Mechanical Division

Air Brake Association

Crystal Room

MONDAY, SEPTEMBER 12

10 am

Address by President C. V. Miller, general supervisor air brake, New York, Chicago & St. Louis.

Foundation Brake Gear—Central Air Brake Club.

Economics of Good Freight Brake Maintenance—Manhattan Air Brake Club.

2 pm

Recent Developments in Air Brake Control—Westinghouse Air Brake Company.

Report of Committee on Standardization of Air Brake Equipment for Diesel and Turbo Electric Locomotives—Chairman, A. M. Malmgren, general diesel and air-brake supervisor, St. Louis-San Francisco.

Report Approved Maintenance Practice Committee—3CD Compressors, P-3 Decelostat Equipment and Angle-Cock Conversions. Chairman, F. W. Dell.

TUESDAY, SEPTEMBER 13

9 am

Paper by representative of the New York Air Brake Company.

1954 "Convention in Print." Members requested to be prepared to discuss or raise questions regarding same.

Main Reservoir Safety Valves for Diesel Locomotives: Location, Maintenance and Testing—Pittsburgh Air Brake Club.

WEDNESDAY, SEPTEMBER 14

9 am

Joint meeting with the Railway Fuel and Traveling Engineers Association. Subjects:

Air Brake Troubles in Cold Weather—Montreal Air Brake Club.

Maintenance and Lubrication of CD Type Air Compressors—St. Louis Air Brake Club.

2 pm

Election of Officers, reports of committees, and discussion of subjects for 1956 convention.

Question Box. Some member of the association will be requested to answer questions dropped in box provided at speaker's stand, or other convention location. Member's name and title desirable, but not necessary.

Car Department Officers' Association

Louis XVI Room

MONDAY, SEPTEMBER 12

10 am

Address by President R. Schey, general superintendent car department, New York, Chicago & St. Louis.

Report of Committee on Light Repair Tracks and Train Yard Operation—J. Hansen, assistant superintendent car department, Chicago, Milwaukee, St Paul & Pacific.

2 pm

Address (speaker not named)

Report of Committee on Interchange and Billing for Car Repairs—C. W. Kimball, chief of car inspection, Southern.

Report of Committee on A.A.R. Loading Rules—J. M. Hick, general car foreman, Great Northern.

Report of Committee on Construction, Maintenance and Upgrading of Freight Car Equipment—E. D. Fortune, car foreman, Atchison, Topeka & Santa Fe.

TUESDAY, SEPTEMBER 13

9 am

Report of Committee on Wheel Shop Practices—E. N. Spencer, wheel shop foreman, Illinois Central.

Address (speaker not named)

Report of Committee on Car Lubrication—W. J. O'Brien, general car foreman, Nickel Plate district, New York, Chicago & St. Louis.

Comments by W. M. Keller, executive vice-chairman and director of research, Mechanical Division, AAR.

Car Department Officers' Association *(Continued)*

WEDNESDAY, SEPTEMBER 14

9 am

Report of Committee on Maintenance of Passenger-Car Equipment—W. E Symons, assistant general mechanical superintendent New York, New Haven & Hartford.

Report of Committee on Air-Conditioning Equipment—Operation and Maintenance—R. E. Johnson, general electrical foreman, New York, Chicago & St. Louis.

Report of Committee on Painting—Basic Preparation of Painting Railway Equipment—R. C. Fisher, foreman painter, Cleveland, Cincinnati, Chicago & St. Louis.

2 pm

Report of Committee on Maintenance and Servicing of Mechanical equipped Refrigerators Cars—M. B. Adams, assistant supervisor diesel engines, Atchison, Topeka & Santa Fe.

Miscellaneous reports; lection of officers.

Locomotive Maintenance Officers' Association

Grand Ball Room

MONDAY, SEPTEMBER 12

10:30 am

Report of Committee on Personnel Training. Chairman C. A. Love, assistant superintendent machinery, Louisville & Nashville. *Topic:* The Foreman Problem, Present and Future.

Address by Hon. Owen Clarke, member, Interstate Commerce Commission.

2 pm

Report of Committee on Diesel Maintenance Mechanical. Chairman H N. Chastain, division master mechanic, Atchison, Topeka & Santa Fe. *Topic:* Power Assemblies and Bearings.

Report of Committee on Diesel Material Reconditioning and Control. Chairman J. J. Ekin, Jr., assistant to general superintendent motive power and equipment, Baltimore & Ohio. *Topic:* Repairs and Reclamation of Diesel Parts in Railroad Shops.

TUESDAY, SEPTEMBER 13

9 am

Report of Committee on Shop Planning. Chairman R. E. Harrison, supervisor diesel locomotive maintenance, Southern Pacific. *Topic:* Fullest Possible Use of Existing Shop Facilities.

WEDNESDAY, SEPTEMBER 14

9 am

Report of Committee on Diesel Electrical Maintenance—Running. Chairman W. C. Monk, supervisor diesel equipment, Canadian National. *Topic:* Control of Electrical Delays and Ground Relay Action.

Report of Committee on Shop Practices. Chairman O. L. Hope, mechanical superintendent, Missouri Pacific. *Topic:* Diesel Axle, Wheel and Truck Maintenance.

2 pm

Report of Master Boiler Makers' Section—Chairman H. M. Schudlich, engineer of water service, Northern Pacific. *Topics:* (1) Study of the effects of Oil in Feedwater of Locomotives and Stationary Boilers and Water in Diesel Cooling Systems, with Recommendations of Methods to Eliminate same. (2) Water and Steam Conditioning for Package Boilers and Stationary Water-Tube Steam Generators.

Address by John A. Hall, director of Bureau of Locomotive Inspection Bureau of Safety and Service, I. C. C. *Topic:* Good Inspection Means Good Maintenance.

Report of Committee on Diesel Maintenance General. Chairman F. E. Stubbs, assistant diesel superintendent, Southern. *Topic:* A Positive Electric and Mechanical Diesel Maintenance Program.

Railway Fuel and Traveling Engineers Association

Bal Tabarin

MONDAY, SEPTEMBER 12

10 am

Address by President W. H. Fortney, district road foreman of engines, Cleveland, Cincinnati, Chicago & St. Louis.

Report of Secretary L. H. Peters.

Address by D. A Fawcett, resident vice-president, New York Central System.

Safety—J. H. Williams, superintendent safety, Texas & Pacific.

Open discussion on Waste Fuel Oil at Service Stations.

Loss and Damage Due to Rough Handling—C. A. Naffziger, director, Freight Loss and Damage Prevention Section, AAR.

9 am

Diesel Question and Answer Panel—Representatives of Electro-Motive Division, General Motors Corporation; American Locomotive Company, General Electric, Baldwin-Lima-Hamilton Corp., and Fairbanks, Morse & Co.

TUESDAY, SEPTEMBER 13

9 am

Diesel Failures—Cause and Remedies. Chairman R. R. Rich, road foreman of equipment, Chicago, Rock Island & Pacific.

Coal Fired Steam Turbine Locomotive—L. M. Newton, mechanical inspector, Norfolk & Western.

Operation of Diesel Locomotives in Extreme Cold Weather—E. Erickson, diesel road foreman of engines, Canadian National.

Method of Educating Locomotive Personnel—S. E. Back, Pennsylvania.

Possibilities of Burning Lower Cost Diesel Fuels and Effects of Their Use—Ray McBrian, engineer standards and research, Denver & Rio Grande Western.

WEDNESDAY, SEPTEMBER 14

9 am

Joint meeting with Air Brake Association. Subjects:

Air Brake Troubles in Cold Weather—Montreal Air Brake Association.

Maintenance and Lubrication of CD type air compressors—St. Louis Air Brake Club.

Open Discussion on Freight-Train Handling.

2 pm

Official business—Results of election, etc.

Trouble Shooting on Clarkson-Vapor Steam Generators—Chairman R. H. Francis, general road foreman equipment St. Louis-San Francisco.

Oil-Burning Gas-Turbine Locomotive—C. Shipman, road foreman engines, Union Pacific.

Electrical Section
Establishing New Standards

The Section continues to take on added work and is completely revising its Manual

Vice Chairman Gordon presents the Chairman's Medal to R. I. Fort.

■ Under the guidance of its Chairman, R. I. Fort, the conduct of the three-day meeting of the Electrical Section, A.A.R., held in Montreal, Canada, June 20-23, resembled that of a single large committee, in which the members were all interested in the subjects at hand. Discussion was lively, but very little of it was caused by someone misunderstanding the intent of a report. Contents of the reports covered many new developments in the field of railroad electrical applications and extended sections of the same reports consisted of material for the Section's Manual which is being completely revised and rewritten. The reports are probably the most informative and useful ever compiled by the Section.

The opening session on Monday morning consisted of a joint meeting of the section with the Mechanical Division, A.A.R., which was addressed by C. N. Crump, president, Canadian Pacific; R. G. May, vice president, operations and maintenance department, A.A.R., and D. S. Neuhart, chairman A.A.R. Mechanical Division and general superintendent, motive power and machinery, Union Pacific.

Mr. Crump stressed the importance of free private competition in establishing the prosperity of any country and the welfare of its people.

With reference to the Electrical Section, Mr. May said, "The close working arrangement with the Electrical Section has solved many of the problems arising in connection with additional improvements in the electrical and electronics field for the mechanical officer."

Speaking of the railroad business, Mr. Neuhart said, "It requires that we join ranks as one to improve our service and our economic status as a whole."

The Electrical Section meetings were opened by Chairman R. I. Fort, electrical engineer, equipment, Illinois Central. He extended thanks to committee members and others for the work they had done and in explaining the need for active discussion, he said that the reports, however, excellent, need to be refined in the fire of open discussion. Organizations, he added, can suffer more from easily satisfied people than from inefficient or mediocre ones.

Vice Chairman K. H. Gordon, assistant electrical engineer, Pennsylvania, presented the chairman's medal to the retiring chairman, R. I. Fort.

E. K. Goldschmidt, manager, Chicago Office, Safety Car Heating and Lighting Company, presented a gavel to Mr. Fort, and pledged the cooperation of the Railway Electric Supply Manufacturer's Association to the Electrical Section.

K. H. Gordon outlined the activities and decisions of the Committee of Direction taken since the 1953 meeting

E. K. Goldschmidt assures the Section of the continuing support of the Railway Electric Supply Manufacturers Association.

ELECTION OF OFFICERS

New officers elected to serve during the coming year are: Chairman: K. H. Gordon, assistant electrical engineer, Pennsylvania. Vice Chairman: S. B. Pennell, assistant engineer, New York Central.

Members, Board of Direction: E. J. Feasey, general supervisor of diesel equipment, Canadian National and J. J. Schmidt, electrical engineer, Denver Rio Grande Western.

R. I. Fort
Chairman

K. H. Gordon
Vice-Chairman

S. W. Marras
Secretary

in Atlantic City, N. J. The Manual, he said, is to be completely revised and reprinted, a part of this work having already been accomplished. He announced that the 1956 meeting of the section would be held in June, in Chicago, with exhibits.

The report of the Committee on Coordination with the American Standards Association's Committee 7, was presented by L. B. Curtis, assistant engineer, office of electrical engineer, Pennsylvania. This committee is now considering various phases of the use of aluminum conductors.

S. B. Pennell asked if the use of butyl rubber insulation would result in an appearance reduction of the size of the wire.

T. G. Isel, assistant car equipment engineer, Pullman Company, said that since butyl will stand a higher temperature and may be a better conductor of heat, a slightly smaller wire size might be permissible. This, he said, however, has not been determined.

Mr. Fort inquired about a new type of insulated wire being used by the Electro-Motive Corporation, and it was explained that the wire which does not require conduit has been used on locomotives for about a year.

Mr. Isel asked if it were the committee's intention to study synthetic wire designed for direct burial. Mr. Troop replied that further study by the committee may include such conductors.

C. R. Troop describes properties of new types of wire and cable.

Wire, Cable and Insulating Materials

The report was presented by C. R. Troop, assistant engineer, New York Central. The committee report states that at the Annual Spring Meeting of the American Society for Testing Materials proposed for letter ballot an ozone-resistant type tape for use on high voltage installations. There are as yet no existing standards for plastic or neoprene tapes.

During 1954, the American Standards Association adopted a specification for weather resistant wire and cable-polyethylene type.

Also during 1954, the ASTM adopted a specification for ozone resisting butyl rubber insulation for wire and cable. This provides for an insulation with many properties such as heat resistance, moisture resistance, ozone resistance and insulation values equal or surpassing the various compound specifications listed as AAR, Electrical Section Specification No. 1000.

Discussion was opened by R. H. Russell, electrical engineer, Great Northern, who said that if AAR cable is ordered, the purchaser would not be sure of getting the best cable. He said there are a number of qualities not covered by the specifications and suggested that the committee write specifications for top grade cable. Mr. Troop replied that changes which are allowable under the specifications give manufacturers latitude to produce better cable whereas specifications which were too tight restricted their opportunity to improve them. He added that if specific qualities or methods of manufacture are wanted, a railroad may specify them. Chairman Fort said the question would be referred to the Committee of Direction.

C. F. Harvey tells of applications of television to rolling stock.

Application of Radio and Communication Systems to Rolling Stock

The report was presented by C. F. Harvey, diesel engineer, Southern. Specifications for the electrical requirements of radio-telephone transmitting and receiving equipment on locomotives, cabooses and other rolling stock have been worked out jointly by the Electrical Section and the Communications Section, AAR. They have already been approved and included in the Communications Section Manual.

The report also outlines electrical requirements for transmitters and receivers. These include regulation, primary power, duty cycle, deviation factor, power factor, and current requirements.

In the discussion, J. J. Schmidt asked if it was the intention of the committee to eliminate 32-volt power supply for cabooses in its recommendation, and it was explained that the report covers only such equipment as is available for direct application to a specific power source. Thirty-two-volt power is usually used only with a converter, and this type of application is covered in the first part of the report.

W. S. H. Hamilton, now honorary member of the Section, asked when 64-volt equipment had become available, and Mr. Harvey replied that both Westinghouse and Motorola sets which use vibrating inverters were available.

K. H. Gordon, assistant electrical engineer, Pennsylvania, pointed out apparent inconsistencies in wattage and volt-ampere ratings given in the report and Mr. Harvey explained that the values shown include a range from minimum to maximum.

L. E. Grant tells what properly applied sprayed metal will do.

Welding and Cutting

The report of the Committee on Welding and Cutting was presented by L. E. Grant, engineer of tests, Chicago, Milwaukee, St. Paul & Pacific.

Seamless plastic fiberglass helmets and plastic cover lenses for helmets and goggles are described in the first section of the report on welding and cutting. The latter are recommended because they are more resistant to pitting than glass covers and are not easily broken in applying or removing.

Rectifier type welders are described and the report states that the rectifier welder offers some of the advantages of both the transformer and motor generator welding machines. One advantage is the wide current range; other advantages are lack of noise, low no-load power consumption and the use of all three phases of the power lines. Another advantage that may be of special value in some railroad applications is the fact that there is no heavy surge of current in starting up, such as is found with motor generator machines. The machines do, of course, have to be blown out periodically the same as other welding machines to remove dirt and dust that accumulates. One manufacturer has a switch on the machine by which the cooling fan can be reversed to blow the dirt out.

With reference to the use of sprayed metal for building up worn wearing surfaces, the report states that, although some serious failures have occurred, these have evidently been caused by improper procedure, and states that a large railroad is reclaiming diesel-electric locomotive crankshafts using the metal spray process to build up undersize main and connecting rod journal surfaces. A total of 28 reclaimed crankshafts of various makes and sizes are on test in road service. Reports to date indicate a very satisfactory performance; especially on several shafts with one or two reclaimed journals which have been in continuous service for periods of over one year.

Recommended procedure is shown by the series of photographs.

Contact electrodes which have a powdered metal coating are described. The report states that they have recently been improved functionally and that they provide a means of applying weld metal rapidly at some increased cost for electrodes.

Cutting electrodes are also described. These are of two types, both coated, one having a solid core wire and the other a metal tube with a ceramic core. The latter is used under water and both employ very high current values.

The composition and function of electrode coatings of all types are described and are classified in a table.

With reference to welding on diesel locomotives, the report states that certain types of engine heads are not weldable and should be scrapped when repairs become necessary. It is also stated that equalizers which have cracks in them or are worn beyond the limit of wear should not be reclaimed by welding.

The carbon arc-air cutting torch is described as a device which has certain advantages. The carbon arc does the cutting while streams of air through fine orifices blow away the slag and molten metal to produce a smooth groove.

In opening the discussion, Mr. Russell suggested that rectifier-type welders should be equipped with disconnect switches and Mr. Grant replied that the committee does not intend to write specifications for any welding machine.

Mr. Gordon asked if the operation of a thermostat on a rectifier-type welder would affect the quality of the weld and Mr. Grant replied that the current would be reduced to such an extent that no welding could be performed. He added that the capacity of the welder changes almost imperceptibly as the welder heats up. Mr. Gordon also asked the hardness of sprayed metal compared with that of base metals, and Mr. Grant said that sprayed metal may contain different metals and also includes voids so that its hardness cannot be measured by accepted procedures. It does, however, he said, wear exceedingly well, which fact may be due in part to the retention of lubricants by the porosity of the metal. Experience also shows that properly applied sprayed metal will stand much abuse in service.

D. S. Neuhart wants locomotive electrical parts which can withstand water and oil.

Address by D. S. Neuhart

The second-day session of the Electrical Section was opened by an address by D. S. Neuhart, Chairman of the Mechanical Division and general superintendent of motive power and machinery, Union Pacific. In the course of his brief talk, Mr. Neuhart said, "From the one or two headlight electricians, our electrical personnel has grown to become one of the largest and most important segments of our railroad maintenance and engineering organizations. As a specific example, I can state that the electrical maintenance force on the Union Pacific has increased from about 12 per cent to 24 per cent of the total force in a 10-year period.

"The reason for this phenomenal growth is obvious from the most casual observation. In a span of a few short years, new developments in the electrical field have brought a completely new conception of railroading, along with changes in our very way of life. Things which seem to be beyond the realm of possibility today are accepted as commonplace tomorrow."

He also said, "We have an abundance of inventors and gadgeteers who can suggest any number of new devices and additions to equipment. Some of them may be a genuine contribution toward the constant need of betterment at a justified cost. By no means do I wish to discourage such developments. But by the same token we cannot afford the luxury of additions to and complications of apparatus where the function would be served through a simplification of what we have."

Specifically, he urged the electrical men to work toward locomotive electrical equipment which would be impervious to water and oil.

C. R. Wadham describes improved methods of fueling diesels.

Motors and Controls

C. R. Wadham, assistant engineer, Illinois Central, presented the report of the Committee on Motors and Controls. The first section of the report consists of a description of sanding facilities in which photo-electric cells control the operation of a locomotive sanding plant.

Two major developments in motors are described in the second

section of the report. One of these is the introduction of new insulating materials such as Mylar, which has permitted reduction of the size of motors. The other is a 20-hp capacitor-start motor which has a starting current of 190 amp, compared to 400 amp for an ordinary 20-hp single-phase motor, yet has 150 per cent starting torque.

An application of magnetic amplifier control of a battery charger is described in the report of the subcommittee assigned to study this subject. The output d-c voltage is closely regulated with respect to a varying a-c voltage and a rapidly changing load. If the load attempts to exceed a safe limit, the charger converts to a constant-current device.

Under the subject, "Improved Methods of Fueling," a subcommittee describes an automatic diesel fueling system installed by the Central of Georgia, at Columbus, Ga.

Under the subject of electronic track scales, the report describes a proposed scale which incorporates electronic weighing. Such a scale, it is said, would lower pit costs, lower maintenance cost, eliminate platform motion, provide constant sensitivity with various loads, permit multiple remote reading points, and be extremely stable with time temperature humidity and vibration. Most of the initial theoretical work for such a scale has been done.

Discussion initiated by Mr. Schmidt centered largely around the oil fuel pump control system described in the report. It appeared from this that an oil leak would start the pump which would then continue in operation.

C. R. Bland sums up a discussion on water coolers.

Air Conditioning and Refrigeration

C. R. Bland, assistant electrical engineer—rolling stock, Chesapeake & Ohio, presented the Report on Air Conditioning and Refrigeration, assisted by J. L. Christen, supervisor of air conditioning, Pullman Company, W. J. Madden, assistant engineer, Pennsylvania; R. F. Dougherty, general electrical and air conditioning inspector, Union Pacific, and J. J. Schmidt, electrical engineer, Denver & Rio Grande Western.

With relation to temperature and humidity control, the committee reports that the Waukesha Motor Company has discontinued the use of a compressor unloading device in favor of the use of a modulating valve which controls the speed of the driving engine. The Frigidaire Corporation recommends that a device be used to assure 100 per cent loading of the compressor periodically, at intervals of possibly 30 minutes. This prevents certain cylinders being unloaded long enough to cause poor internal lubrication.

Concerning the heating of passenger train cars, the report describes several means developed by the manufacturers to simplify equipment.

Specifications for electric drinking water coolers for diesel-electric and electric locomotives are included in the report.

One part of the report shows that according to the records of one railroad cooling failures of electro-mechanical equipment were due to several causes as follows:

Generators—Batteries	30 per cent
Compressor motors	9 per cent
Condensers	10 per cent
Loss of Freon	9 per cent
Miseellaneous	32 per cent

Another analysis showed that 20 per cent of the total cars operated were responsible for 75 per cent of all failures.

There follow recommendations on how inspection and maintenance should be scheduled. These show how certain items which continuously require maintenance should be considered for change and improvement.

Assignment No. 5 b in the report deals with the analysis of generator and battery capacities and one analysis of this problem is to start with the average electrical load on a hot summer day. With a load factor of 75 per cent and an 8-ton air conditioning load, this will average 12 kw on a coach.

The principal function of the battery is to afford standby protection at low car speeds, and when the car is standing. The battery should have capacity to provide 4 hours' protection in the event of a detention of long duration. This detention may occur when the battery is not fully charged. On this basis, 48 kwhr of energy are required. On a four-hour discharge rate, the battery capacity will be decreased to 85 per cent of its 8-hr rated capacity. Therefore, the required battery capacity will be

$$\frac{4 \times 12}{85\%} = 56.5 \text{ kwhr.}$$

The generator should have sufficient capacity to carry the average car electrical load and charge the battery simultaneously. The time element should be say three hours or the running time of an average division. The battery may be discharged say 50 per cent. The battery efficiency will be approximately 80 per cent. On this basis, the generator capacity can be calculated from the following equation:

12 kw plus (28.3 kw divided by 80 per cent $\times$ 3 hr) = 23.8 kw

The car may be used in interurban service, less than three hours run, with one and one-half hours turn-around time. In this case, there would be less precooling time or battery discharge, perhaps 40 per cent. The equation then becomes:

12 kw plus (22.6 kw divided by 80 per cent $\times$ 3/2 hr) = 30.8 kw

The various methods of testing the effectiveness of air filters are described in the report and the committee is in the process of developing a standard method.

The subcommittee on assignment No. 7 to prepare general specifications for air conditioning existing railroad buildings, or parts thereof, has produced general specifications for window or room-type air-conditioning units, general specifications for self-contained air-conditioning units, and general specifications for central station air-conditioning systems.

The report of a subcommittee assigned to prepare general specifications for types of condensers used on electro-mechanical air-conditioned cars, describes the types used, methods of servicing and cleaning (caustic solutions, acid solutions, and sand blowing) and the economics of the dry and flooded types. The conclusion is drawn that in areas where the sustained ambient temperatures are in excess of 100 deg F and where dust or foreign material is critical, the full-flooded type is most suitable. In all other areas, it is concluded, that the dry type is attractive because of its lower maintenance cost and because the compressor operation will be more reliable than with the spray-evaporative type.

Assignment No. 10 deals with the standardization of plugs and receptacles on mechanically refrigerated cars and it is recommended that all power plugs and receptacles on refrigerator cars equipped with mechanical refrigeration be A.A.R. Standard as shown in Section 3, pages 1-5-1, 1-5-2 and 1-5-3 of the Electrical Section Manual.

Due to space limitation and other conditions, it may be necessary to use fixed receptacles on both the alternator and compressor motor. Where this is necessary, the internal portion of such receptacles should still conform to the A.A.R. Standard and be compatible therewith.

The first part of the discussion was concerned with dirt getting into drinking fountain water when bottles were changed and Mr. Bland agreed that the specifications should include requirements for cleaning. Mr. Madden expressed the opinion that the cleaning is really a part of the regular maintenance program and said that the procedure should be decided by each road.

D. E. Jones, air conditioning engineer, Canadian Pacific, raised the point that the term freon or F12 was too specific, and should be broadened by using an all-inclusive chemical name which would cover all refrigerants of this type.

C. W. Martin expressed the opinion that the specifications for one- and two-cylinder compressors for water coolers should include the sealed type. Mr. Bland said he thought it could be so written.

Mr. Pennell asked how many cars were included in the study covered in the report and Mr. Christen said it was about 1,000.

Concerning air filters, D. Farr, of the Farr Company, was asked what progress was being made toward the standardization of air filtration. He said attempts are being made to obtain agreement, and that Dr. K. Whitney, of the University of Minnesota, is working on this for the American Standards Association. H. E. Donovan, of the Maize Corporation, said he looks to a realistic approach to this problem.

H. C. Cross evaluates various methods of switch heating.

Electric Heating

The Report on Electric Heating was presented by H. C. Cross, electrical engineer, construction, Baltimore & Ohio, assisted by D. M. Burckett, electrical engineer, Boston & Maine; L. B. Curtis, assistant engineer, Pennsylvania, and H. C. Griffith, Jr., General Electric Company.

The first two sections of the report are made up of revised specifications for electric switch heaters. This is a reorganization of Manual material.

With reference to built-in electric heating in platforms, the report states that while it is undoubtedly advantageous in certain applications, that the railroads have few, if any installations. Examples of the use of such heating are given, such as the melting of snow on exposed ramps where industrial trucks must operate. In two of the cases cited a wattage of 40 watts per sq ft is used which is sufficient to melt up to 2 inches of snowfall per hour.

Data on the cost of snow removal has been obtained by means of a questionnaire sent to 52 railroads. Of the 52, 12 replied that climate did not require the use of heaters or they had no information.

From the 40 replies received, the subcommittee has compiled tables and charts showing the data received and the relative economics of snow removal from track switches. From this source of information the committee has developed a comparison of annual recurring expenses for 200-hr use per 1,000 ft of switch length as shown in the table.

	Kerosene pots	Propane gas	Electric
Fixed Charges:			
Interest, depreciation and insurance	$1,060	$8,350	$4,150
Operating Costs:			
Labor, including annual removal	9,410	1,800	.....
Supervision, overhead, food, etc.	1,800	200	.....
Fuel, including handling and facilities	2,800	2,500	.....
Electricity, including demand and energy	.....	.....	3,068
Maintenance, including overhead	200	3,245	600
Total recurring expense	$15,350	$16,095	$7,818

Tests of switch heaters on the Pennsylvania at Holmesburg, Pa., made during the winter of 1953-54 showed that for the type of service tested, 125 watts per foot was too low a rating for satisfactory performance.

During the course of the discussion, Mr. Cross said he had seen a report prepared by the Central Railroad of New Jersey covering the use of a diesel-electric locomotive for supplying power for switch heating. This may be covered in the 1956 report.

Mr Gordon offered high endorsement of the work done by Mr, Griffith, and Mr. Marras said that such work serves effectively to keep Electrical Section research costs within its budget.

H. P. Wright takes pleasure in presenting the Report on Corrosion.

Corrosion

The Report of the Committee on Corrosion was presented by H. P. Wright, electrical engineer, Baltimore and Ohio. For the benefit of those who need be concerned about buried metals near to each other and connected electrically, the report includes an electromotive series table that indicates which, and relatively how much, one of the metals may be expected to corrode.

The report states that organic protective coatings on buried structures may be used with moderate effectiveness, but that bituminous and thermoplastic coatings do not adhere well are are subject to mechanical damage. Thermosetting resin coatings, it is said are about the best for mechanical stability and satisfactory edherence.

A combination of coatings and cathodic protection is recommended for the interior of steel water storage tanks.

A pad of sand and crushed rock is recommended for use under steel oil storage tanks. The bottom of the tank is shop painted before it is placed on the sand cushion.

An elaborate system of buried metal protection used at the Fairless Works of the U. S. Steel Corporation near Morrisville, Pa., is described for the benefit of those concerned with this subject.

The report was highly complimented by E. G. Gehrke, secretary, Engineering Division, A.A.R.

C. P. Trueax explains the economics of network power distribution.

Power Supply

The Report of the Committee on Power Supply was presented by C. P. Trueax, assistant electrical engineer, Illinois Central, assisted by H. C. Cross, engineer of electrical construction, Baltimore & Ohio. The report outlines the value of networks for power supply systems. Definite economies are shown for such systems, and it is indicated that the usual objection to operating 220-volt motors on 208 volts is not a serious one.

Attention is called to the advantages of HRC (High Rupturing Capacity) fuses to take care of fault currents in excess of those which can be interrupted satisfactorily by a conventional 600-amp cartridge fuse. The HRC fuse uses fine silver links embedded

in chemically inert arc-quenching filler and is bolted directly to the bus bar instead of being installed in fuse clips.

In the discussion, Mr. Fort called attention to the accepted railroad practice of using 220 volts instead of network voltage for a-c motors on air-conditioned cars.

To ease the problem of supplying power to Pullman cars parked for occupancy, Mr. Russell suggested that a number of railroads might establish a pool of material for this purpose which could be moved around as needed. This would require the storing of material and Mr. Dougherty said the leftover material need not be stored since it may be very quickly used for other purposes. Mr. Russell differed with Mr. Dougherty, saying that leftover material was not easily usable, and had to be stored. Mr. Fort said his railroad must provide for three events a year, and that it has been necessary to build up a supply of material which is stored. He said that a power car offers some definite advantages.

J. F. Partridge answers questions on the load testing of engines.

Automotive and Electric Rolling Stock

The Report of the Committee on Automotive and Electric Rolling Stock was presented by J. F. Partridge, assistant engineer, New York Central, and R. P. Turnbull, electrical inspector, Pennsylvania.

A major part of the report of the Committee on Automotive and Electric Rolling Stock consists of a revision of Section G of the Manual in a new Section 7. This deals with methods of testing locomotive performance characteristics.

A subcommittee assigned to study the standardization of diesel electric locomotives has made recommendations covering magnet valves and fractional horsepower motors used on diesel-electric locomotives. It also describes a traction motor disconnect device made by the Torman Company, Chicago, which has turned in a good record of performance over 122,800 miles.

The latter part of the report is a revision of the committee's 1954 report, and deals with ground relay pickup valves, elimination of dust from control equipment, load indicators, and transition indicators, and capacitance bridge type fuel indicators.

In response to a question raised during the discussion, it was explained that the formula given in the report for locomotive power plant output included an efficiency of 93.7 per cent. It was recommended by Mr. Turnbull that the question of what should be expected as engine output be referred to the Mechanical Division for its recommendations.

Mr. Fort told of how overrating reduced the life of pistons to a small fraction of what it was when the locomotive was derated a few per cent.

Mr. Turnbull asked if a 27-point jumper is enough to serve all purposes, and Mr. Martin said that most railroads seem to prefer that alarm circuits be not trainlined. Mr. Fort added that he agreed generally with Mr. Martin, but that on the Illinois Central, they had returned the hot-engine alarm to the trainline. In the case of unused trainlines, Mr. Martin said it is better to have the wire terminated at a convenient place than to carry it into the receptacle contact.

Relations With Public Utilities

The report on Relations With Public Utilities was presented by K. H. Gordon, assistant engineer, Pennsylvania, and E. H. Anson, Sr., Vice President, Gibbs & Hill, Inc.

The first part of the report on relations with public utilities consists of data presented to show the phenomenal growth of the power industry in the United States.

The latter part of the report is concerned with the relative cost of transmitting electric energy versus transporting fuel. Two recent papers on the subject are quoted. One author concludes as follows:

1. Although coal will continue to be the principal source of energy, long distance transmission can be justified economically only on the basis of large capacity generating stations located practically at mine mouth with an assured supply of low cost fuel.
2. Transportation industries must be in a position to meet the competition of long distance transmission, as transmission investment assures a long time fixed rate for transporting energy.

The other author sums up his findings with the following:

1. Although it is not possible to present a generally applicable formula for the cost of transmitting energy, it is not difficult for the competent engineer to prepare a reasonably accurate estimate, once the conditions are known for a particular case. Each case must be the subject of a separate study.
2. In relatively few cases, under present conditions, can long distance transmission, even at very high voltage, be justified on the basis of competition with coal transported by rail.
3. The larger the concentration of generating capacity in a power plant and the better the load factor, the longer the distance at which power can be transmitted economically.
4. The higher the efficiency of the power plant and the better the grade of coal available, the shorter the distance at which power can be transmitted economically.
5. During the early stages of periods of rising prices, transmission line construction is more attractive to the power companies as they can thus be assured of a long term, relatively constant rate for transporting energy.
6. The railroads should keep themselves alert to the problem in order to exert every effort to maintain a favorable competitive situation.

L. B. Curtis sees brighter future for railway electrification.

Railway Electrification

The several sections of the Report on Railway Electrification were presented by L. B. Curtis, assistant engineer, Office of Electrical Engineer, Pennsylvania, B. C. Hallowell, engineer of transmission and electric traction, Long Island, L. W. Birch, transportation department, Ohio Brass Company, and H. F. Brown, Gibbs & Hill, Inc.

The report is opened with the following statement:

Committee 13 has taken a positive and active approach to the general subject of railroad electrification. The work was not limited to the recording of statistics and the history of a dying mode of transportation. Rather we have seen possibilities in the future of further electrification in this country and are endeavoring to discover improvements in the art, and to facilitate for management ways and means to compare and study electrification versus other means of motive power.

Detailed technical sections of the report deal with trolley wire height (19 ft is recommended where men are not permitted on tops of cars), specifications for bronze and copper trolley wire, lubrication of trolley wire, trolley wire wear, and failure and track and third rail bonds.

Under the subject of development in the field of railway electrification, the report includes ignitron cars and locomotives on the New Haven, 180 miles of 3,000-volt d-c electrification in Belgium, a 3-year program for 15-kv low-frequency electrification

in the Ruhr district of Germany, plans for India, the extension of the 22-kv, 50-cycle of the Bas-Congo-Katanga Railway in Africa and the work being done on 25-kv, 50-cycle electrification by the French National Railways.

Methods of making electrification studies have been worked out in considerable detail and included in the report.

A questionnaire was sent out last year for the purpose of developing an annual report on pertinent physical, operating and economic statistics on railroad electrification systems. Returns have now been tabulated for the principal railroads in the United States and are included in the report. This information is new and contains valuable data not heretofore published.

Discussion raised the question of the 19-ft height of contact wire mentioned in the report. It was explained that this is adequate for application where men are not allowed on tops of cars, that it permitted a considerable reduction in the cost of the contact system, and that it made for better performance of pantographs.

In presenting his section of the report, Mr. Birch read a number of excerpts from current articles and talks bearing out the contention that electrification will regain favor in railroad operation.

Mr. Brown voiced objection to the manner in which diesel and electric locomotives are compared in the report. He also said that the objections to the unbalancing of phases raised in the report are greatly overdrawn.

Mr. S. V. Smith, assistant electrical engineer, Pennsylvania, called attention to the fact that m-g sets have not been included in the report and said that information is needed concerning their potentials when used on a 60-cycle system. He also said that more information is needed on the cost of 60-cycle systems.

S. B. Pennell conducts discussion of the car electrical equipment report.

Car Electrical Equipment

The Report of the Committee on Car Electrical Equipment was presented by S. B. Pennell, assistant engineer, New York Central, and S. V. Smith, assistant electrical engineer, Pennsylvania, and T. G. Isel, assistant car equipment engineer, Pullman Company.

The first 60 pages of the Report on Car Electrical Equipment consist of a very thorough revision of those sections of the manual which deal with storage batteries, axle generator equipment, car electrical distribution systems and train lines.

Subcommittee No. 1 was given an assignment to develop a standard battery terminal bolt size and has recommended that "Battery terminal bolts shall be 5/16 in. in diameter, with 18 threads to the inch." No length is specified since battery terminals are of varying thickness.

Concerning diesel engine-driven generator sets, the report calls attention to the use of relatively large, slow-speed units which have been installed in the body of full dome cars which take revenue space, but which offer the advantages of longer life and greater reliability.

The report states that the trend in axle-driven equipment for caboose power supply seems to be toward the alternator-rectifier type, and 12 volts seems to be most favored. This axle-driven equipment, the report states, requires much less maintenance than the engine-driven equipment, and is of 1.0 to 1.5-kw capacity. It adds, however, that where larger amounts of power are required (upwards of 2.5 kw) the engine-driven generator has an advantage and a smaller storage battery may be used.

There are at the present time, 24,168 cabooses owned by American and Canadian railroads, 2,398 of which have been equipped with electric power. Of these, 90 per cent employ axle-driven generators and 7 per cent are equipped with diesel or propane engine-driven generators. There are a few with other sources of power including primary batteries. Generator voltage is 12-15 d-c on 65 per cent of the installations and the next most popular voltage is 28-35, which totals 20 per cent. Power at 110-120 volts d-c is used in 7 per cent of the installations. Generator ratings from 0.86 to 1.5 kw include 73 per cent of the total. The capacity of batteries in 82 per cent of the applications ranges from 150 to 300 amp-hr.

Different types of ground detection methods are discussed in some detail. They include flashing (which consists of placing a pair of pliers between a battery lead and a grounded bolt), the single- and two-lamp methods, the differential relay method, and the use of the vibrator-type ground detector. The report states that there is no one instrument now available that will satisfactorily meet all conditions and recommends that the assignment be continued.

The committee, in investigating methods for testing Spicer drives and clutches, has developed recommended procedure for checking and overhauling drives which have been in service. The illustrations show a drive used to test overhauled units. It consists principally of a wheeled, holding fixture having a quick clamping arrangement and a 10-hp variable-speed drive with connecting shaft and companion flange. There is also provision for a pony brake to load the unit and prevent backlock. Take-off shaft speeds can be varied between 600 and 1,800 rpm. During a test, the unit is run at 600 rpm for 30 minutes in each direction, then at 1,000, 1,200, 1,400 and 1,800 rpm for one hour at each speed; 30 minutes in each direction.

The final section of the report summarizes the preference of railroad men for voltages to be used respectively, with axle-generator systems and individual undercar power plants. The replies to a questionnaire showed that for axle systems, 8,901, or 22.77 per cent, preferred 32 volts d-c; 16,456, or 42.09 per cent, favored 64 volts d-c; and 13,734, or 35.14 per cent, considered 110 volts d-c to be the best choice.

Inasmuch as there is a plurality, for 64 volts, the committee submits that this plurality be accepted as the best indication of opinion that can be obtained at this time.

The results for undercar power plants were as follows:

32 volts d-c . . .	4,147 volts . . .	10.6 per cent
64 volts d-c . . .	2,343 volts . . .	6.0 per cent
220 volts a-c . . .	32,421 volts . . .	83.4 per cent

In view of the majority for 220 volts a-c for individual power plants, it is recommended that this voltage be adopted as standard for future passenger cars.

A considerable amount of discussion was given to the required length of jumper cables for use between cars. It was summed up by Mr. Fort who said that specifications had better be kept simple so that new types of train lines may be taken care of as the need develops. The increasing importance of ground measurements on passenger cars was discussed in detail and Mr. Schmidt said his road (D. & R. G. W.) will either equip its cars with permanent ground detectors or will supply electricians with meters.

D. F. Dunsmore summarizes current practice on cleaning of electrical parts.

Repair Shops

The report was presented by D. F. Dunsmore, electrical engineer, Chesapeake & Ohio. Concerning shop procedures, the report states that after studying the question of the types of intervals

used in scheduling inspections, maintenance and repairs; it was the consensus of opinion of the subcommittee that time or calendar period intervals for scheduling of inspection, maintenance and repairs have many advantages over fuel consumption, mileage or other intervals; particularly when a large number of locomotive units, operating under similar conditions is involved.

There then follows a detailed discussion of all the factors involved to show why this conclusion is reached.

Supplementing its 1953 report, the subcommittee on repair facilities outlines the type of shop facilities required by railroads operating respectively 10 or less, or 20 or less, locomotive units.

Tentative estimates of the costs are given in the two tables.

SHOP FACILITIES FOR TEN OR LESS LOCOMOTIVES

Building: 50 ft wide by 110 ft long by 30 ft high, with one inspection pit.	
Construction: steel frame, brick curtain walls, corrugated wire glass, corrugated asbestos siding, and rolling steel doors.	
Price: includes trackwork inside building, drainage and painting	$ 75,000
20-ton overhead floor operated crane	25,000
Heating in building	5,500
Plumbing	3,000
Electric lighting and power wiring in building	10,000
Roof ventilators	2,000
Office furniture, shelving, lockers, etc.	2,100
Lube oil storage and piping system	3,500
Compressed air piping in building	900
Total cost	$127,000

SHOP FACILITIES FOR TEN TO TWENTY LOCOMOTIVES

Building: 90 ft wide by 140 ft long by 30 ft high, with two inspection pits.	
Construction: Same as for the single track building	$171,100
30-ton overhead floor-operated crane	30,000
Heating in building	7,000
Plumbing	3,000
Electric lighting and power wiring	18,000
Roof ventilators	3,600
Office furniture, shelving, lockers, etc.	3,600
Lube oil storage and piping system	4,500
Compressed air piping	1,200
Total cost	$243,000

Note: The above estimates do not include any facilities outside the building proper, and are subject to possible reductions, depending on type of construction and related shop facilities.

A list of the tools required is also included.

Facilities for layover and care of diesel locomotives at outlying points are discussed and listed in detail.

The subject of high potential d-c testing has been given extensive study, which is outlined in the report. Two important conclusions are drawn. One is that tests have definitely indicated basic advantages of d-c over a-c testing. The other is that d-c overpotential testing should be employed not only to check whether the equipment is good, but to indicate how good, and how much longer the machine or equipment can be expected to operate without failure.

For electrical testing other than high potential, the report describes a device, with 52 contacts, which connects a voltmeter by means of many wires to various points on the locomotive. It is said that it works very fast and well for single defects, but may not do so well in the case of interlocking related circuits. The suggestion is made, that it is particularly well suited for places where personnel is not too well acquainted with circuit tracing.

Circuits for testing jumper cables are shown in two charts.

The advantages and disadvantages of degreasers are listed. In this discussion, the need for timing the degreaser action is emphasized. It is also pointed out that newly developed varnishes are not nearly as susceptible to being dissolved by the degreaser solvents as are older varnishes. It is the opinion of the committee that the advantages at present favor the degreaser.

Specifications and procedures are also included for electrical parts solvent cleaners, mechanical parts cleaners, locomotive interior and exterior cleaners, and cleaners for brush holders, contactors, reversers, cam switches and other electrical parts.

A complete and detailed outline for servicing of diesel locomotive traction motors removed from the trucks as practiced by a few railroads included in the report in tabular form. It is offered as information only and not as recommended practice.

During the discussion, T. G. Isel, Pullman Company, said it is his understanding the d-c high-voltage testing is predicated on keeping records of insulation values to establish a history of a unit in service, and asked if it is possible to keep such a record. Mr. Fort replied that d-c testing has stemmed from its use on large machinery under circumstances in which the keeping of records is relatively easy. The interpretation of such records, he said, requires more knowledge of insulation than is yet available.

Mr. Gordon asked if d-c testing might be successfully used on transformers in which failures often occur between turns. Mr. Dunsmore replied that such applications will be considered in next year's report.

Asked by Mr. Gordon if rules covering high-potential testing included d-c, Mr. Fort replied that there is nothing in the requirements that prohibits the use of d-c. The equipment required, he said, is cheaper and easier to handle, and he has heard no objections to its use.

The section of the report on cleaning materials and methods was presented by H. M. Epps, mechanical inspector, Texas & Pacific. Asked by Mr. Russell why both perchlorethylene and trichlorethylene were recommended for degreasers, Mr. Epps replied that their use depends upon the type of material to be cleaned. For electrical parts, he said perchlorethylene is recommended. J. A. Chisholm, general inspector diesel equipment, Canadian Pacific, asked if these materials were suitable for spray cleaning, and P. G. Sasgen, system diesel supervisor, Pennsylvania, replied that they were recommended only as degreasers. J. O. Fraker, superintendent diesel and electrical maintenance, Texas & Pacific, said he had used both types of cleaners, and is of the opinion that perchlorethylene is generally to be preferred. The choice, he said, is largely dependent on the characteristics of the machining used for cleaning.

C. A. Williamson, electrical engineer, Texas and New Orleans, asked about the effect of ambient temperatures, and Mr. Chisholm replied that they are an important factor in the selection of cleaning agents.

E. J. Feasey is honored for his work with the Wiring Diagrams Committee.

Wiring Diagrams

E. J. Feasey, general supervisor diesel equipment, Canadian National, presented the Report of the Committee on Wiring Diagrams. The committee continues effectively to carry out its work on the standardization of wiring diagrams. It has prepared a table of contents for reorganizing Section H of the Manual into a new Section 18. Specific recommendations in this year's report concern wire markings for schematic and connection diagrams.

Because of the pressure of other duties, Mr. Feasey had been

obliged to relinquish the chairmanship of this committee, and the work has been assigned to C. W. Martin, assistant engineer—diesel-electric, Baltimore and Ohio. Discussion was concerned largely with the number of wires—namely, 60—recommended for use in train lines. Situations were cited where more wires might be required, but it was the consensus of opinion that the committee's recommendations were adequate for all normal requirements.

G. L. Sealey describes new lighting developments.

Illumination

The Report of the Committee on Illumination was presented by G. L. Sealey, assistant engineer, Reading Company, and J. L. Swarner, electrical engineer, Pullman Standard Car Manufacturing Company.

A major part of the work done by the committee consists of revising and reorganizing several parts of the Manual which have to do with lighting into a new Section 5 of the Manual. This now includes a glossary of illumination terms—the lighting of passenger train cars, suggested maintained footcandle values, the lighting requirements of various types of cars, maintenance factors affecting efficient illumination, electric lamp characteristics, selection of fluorescent lamps and evaluation measurements and tests.

A section of the report devoted to developments in electric lighting of interest in the railroad field includes characteristics of a high output rapid-start fluorescent lamp, a 200-watt PAR-46 flood lamp and new infrared lamps. Included also are notes on the value of ventilated fixtures which are self-cleaning and which operate at reduced temperatures.

Headlight pickup tests made at Harmon, N. Y., in 1952 are described. From these tests, it is believed that it can be concluded without question that the 200-watt, 30-volt, PAR-56 headlamps, operated at 30 volts, can definitely be relied upon to give the 800-ft pickup required by the ICC Rule 231 (a) with considerable margin to spare.

Types of lighting for various servicing and major overhaul shop facilities are recommended in the report of a subcommittee assigned to compare different types of lighting.

The same subcommittee offers a report on the location of fuel oil leaks on diesel engines by "black light." Fuel oil and lubricating oil used in diesel engines each have a characteristic natural fluorescence under ultra-violet or "black" light. Lubricating oil generally fluoresces an opaque milky-white. Fuel oil, on the other hand, is generally milky blue. Whenever fuel oil is present in lubricating oil, the milky white background of the lubricating oil becomes milky bluish purple. By tracing back this bluish purple color to its origin, using the ultra-violet light, the exact area of the leak can be determined.

Also included in this section of the report are descriptions of lighting in the New York Central's Collinwood Shops in Cleveland, Ohio; the floodlighting of the Illinois Central's Markham Hump Yard in Chicago; the lighting of the Pennsylvania's Ticket Office in Pittsburgh, Pa.; and floodlighting for railroad yard-television. Accompanying illustrations show the lighting in several parts of the Collinwood shop.

A drawing is included in the report to show the location of lighting units in the Illinois Central's Markham Yard. It is an automatic retarder yard, including 64 classification tracks. The area of the yard is 1,877,500 sq ft, and the illumination is approximately .1685 lumens per sq ft on a horizontal plane.

The new ticket office at Pennsylvania Station, Pittsburgh, Pa., incorporates a modern system of passenger ticket and Pullman reservation service. In addition to the general working area, there are several small offices for the convenience of passengers requiring special attention. Maximum utilization of this system requires high-level illumination.

A fiberglass ceiling for sound absorption was suspended 11 ft high with recessed incandescent and fluorescent lighting fixtures. The fluorescent troffer fixtures are 2 ft wide and 4 ft long, for use with 40-watt, T-12 bulb, rapid-start type lamps, and of such a design that either 2, 3 or 4 lamps can be used. These units are enclosed by sections of two-ft sq molded plastic. The recessed incandescent fixtures use 100-watt lamps and are shielded by concentric metal louvers.

The general working area and the small offices are illuminated by the fluorescent fixtures.

Where television is used in classification yards, a method of illumination is needed for lighting cars to check car numbers. This is done in one case by two banks of 150-watt projector lamps with each of two television cameras. A total of 60 lamps are used.

The subcommittee reporting on standard lamps for locomotive and car lighting sent out a questionnaire to determine the amount of application of all types of lamps in this service, and as a result the committee recommends that five types of lamps be deleted from the list.

On the subject of illumination of passenger station platforms, the report offers the following information.

In line with overall improvements in the downtown area of the city of Pittsburgh, Pa., the Pennsylvania is modernizing its Pennsylvania station.

New station facilities, modern train and umbrella sheds, with low level platforms, have been constructed. There are 8 platforms, each about 18 ft wide and from 900 to 1,300 ft long.

These platforms are illuminated by incandescent lamps, 150-watt, R-40 reflector bulb, flood type, encased in a spun aluminum housing. This canopy protects the bulb from moisture and shields the light source at a 15-deg cutoff angle. A shock absorbing socket is used to reduce lamp failure from filament breakage to a minimum.

Lamps are mounted on 15-ft centers in 2 rows, 18 ft above and 2 ft from the edge of the platform. They are suspended at an angle of 10 deg with the vertical and point toward the center of the platform. This arrangement gives an average intensity of 8 footcandles.

The area between tracks contains locomotive and passenger car servicing facilities. The lighting of this section is accomplished by using fixtures similar to the 150-watt platform type, except with 31-deg cutoff angle. They are mounted 11 ft high on each side of structural steel columns which are spaced on 30-ft centers. There is sufficient illumination in the working area for efficient use of these facilities.

The platforms were placed in service in the fall of 1953. There has been a simplicity of maintenance in that no cleaning has been required and lamps can be easily replaced with a lamp stick.

In the course of the discussion, Mr. Swarner said that if fluorescent lamps of different characteristics are used together it makes a bad appearance. He also recommended the replacement of lamps at regular specified intervals since the cost of replacing a lamp is greater than the cost of the lamp.

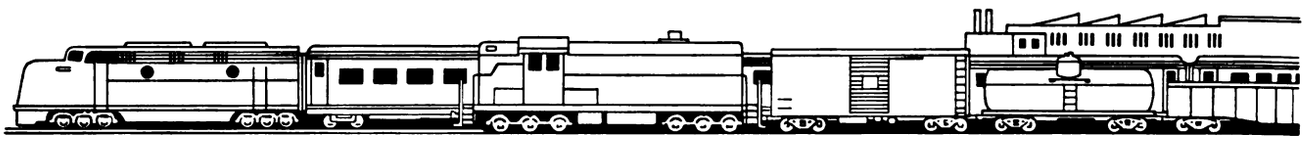
R. L. Henderson, General Electric Company, was called upon to answer a number of questions. Among his answers were statements that germicidal lamps are the most efficient source of energy used for producing fluorescent light, and that as germicidal lamps they must not be placed where they may be seen directly. He said that the output of regular fluorescent lamps is not affected by temperatures above 60 deg F and that special lamps are available for use at lower temperatures. Such lamps, he said, are in use for yard lighting.

Mr. Fort asked if the term Luminaire is to supplant the word "fixture" and Mr. Swarner replied that the new term had now been adopted by the Illuminating Engineering Society.

Fluorescent lamps having a warm color were seid to be preferable for places used for passengers. It was said they show dirt more readily than the daylight type and to take care of this, more cleaning and ventilated fixtures which do not accumulate dust rapidly, were suggested.

The use of black light for detecting fuel oil in lubricating oil was discussed and Mr. Martin told of an additive which can be added to the oil to make the use of the light more effective.

?????



● **THIS IS A BRAND NEW DEPARTMENT which we hope will develop into a "round table" or "forum" where you, our reader, can put up your problems for discussion and say what you think about the other fellow's questions and answers. This will be a place for you to "hash over" maintenance and design problems that concern cars and locomotives and their mechanical and electrical features.**

● **THIS MONTH'S BIGGEST PROBLEM is to get a name for the "new baby." A staff meeting came up with two suggestions—"LOCAR'S LOWDOWN" and "WHO'S GOT AN ANSWER." Maybe you have a better one. We are willing to pay $25.00 for a name that will really identify this page. Let's have your suggestions. Use the coupon below for submitting them.**

As a starter, here's one question that has come up frequently. We threw in all our answers just for a sample. If you have any additional thoughts on this, let's hear from you. Your answer will be treated as a separate item and will be credited to you, as you prefer.

Q—Is there a solution to the problem of flat spots that develop on the wheels of diesel switchers?

A—Diesel switchers have frequently replaced much heavier steam switchers that had the advantage of additional braking power on the wheels of the tender. In handling heavy cuts of cars or working on grades, wheels will lock and slide during braking. Tests have shown that weight transfer can unload the trailing wheels of each truck and cause them to slide while the front wheels continue to roll against the brake shoes. Railroads have attempted many solutions for this troublesome problem.

Probably most widely used is the lowering of the reducing valve setting so that instead of 45 psi, the independent air pressure cannot exceed 40 psi, or even 30 psi. Some roads have replaced the original brake cylinders with smaller ones to reduce the braking power of the locomotive. While training of enginemen can help some, the handling of an unusually heavy cut of cars or poor rail conditions can still result in sliding wheels.

Some work has been done with devices such as the Decelostat for detecting these sliding wheels. Most flat spots are developed in a very short time, and the speed differential between the sliding wheel and one moving at a very slow speed is so slight that these devices have not been too effective. Some lines have operated braking cars which are old steam tenders cut down and ballasted with scrap and concrete. These cars have been fitted with headlights and sanders. The braking power developed on these 87-ton units has speeded yard operations because a single locomotive working with one of them can stop in a much shorter distance and much more rapidly without locking its wheels. Grease on track can not only cause a locomotive to slip when power is applied, but also will cause it to slide when the brakes are applied. One line even discovered that the use of grease heavier than recommended in the traction motor gear case was the cause of flat spots developed on diesel switchers.

Good questions and good discussions are worth money to you. Railway Locomotives & Cars will pay $5.00 for questions that are accepted, and any discussion we publish will pay you our regular space rates (with a minimum payment of five dollars).

To get the show on the road, here are several questions:

Q—Have any special tools been developed for installing the newly-developed journal lubricating devices, can the regular packing hook be of any use, or is this strictly a hand operation?

Q—During the rebuilding of older diesel units, is the most economical solution complete rewiring? When it is used, is this the thing that keeps the unit in the shop the longest, and if it is, how can this time be reduced?

Q—For ordinary heavy freight car repairs does it save time and money to assemble car sides or sections of car sides in a jig prior to their application to the car?

If you have any ideas on any of these we want you to tell us what you have found or developed. We would like to identify you with your answer by giving your railroad and title. However we can leave this out if that is the way you want it.

Q & A EDITOR
Railway Locomotives & Cars
30 Church St
New York 7 N. Y.

MY SUGGESTION FOR A NAME FOR THIS PAGE IS .....

.....

Name .....

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Railroad .....

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Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G296-Q—How are the relays operated?
A—The FTM and FTP are voltage operated relays whereas the BTP is a current operated device.

Load Regulator

G297-Q—What is the load regulator and how is it connected?
A—The load regulator is an automatically operated rheostat connected in series with the battery field of the main generator.

G298-Q—How does it operate?
A—Engine oil pressure is used to force the rheostat to vary its position as directed by a pilot valve in the engine governor, loading the engine according to the throttle setting in the cab.

(Manual 2310, pages 308, 309)

G299-Q—What components does the load regulator have?
A—The load regulator has two components: (1) the pilot valve in the engine governor, and (2) a self-contained unit consisting of an hydraulic vane type motor attached to the commutator type rheostat.

G300-Q—What are the external wiring connections?
A—The only external wiring connections are two leads to the battery field circuit.

Battery Field Contactor and Fuse

(Manual 2310, page 309)

G301-Q—How does this contactor function when the throttle is moved to Run 1?
A—Closes and connects low voltage to the main generator battery field.

G302-Q—How does it function during transition 2-3 or 3-2?
A—The contactor momentarily opens, reducing generator output.

G303-Q—How does the battery field contactor function during dynamic braking?
A—Closes when transition lever is placed in "B" position.

G304-Q—What takes care of the high voltage induced in the battery field when the battery field (BF) contactor is opened?
A—A selenium rectifier and discharge resistor are used to dissipate the high voltage so induced.

G305-Q—What fuse is used and where is it located?
A—An 80 ampere battery field fuse, located in the low voltage panel, protects the battery field circuit.

G306-Q—What are the results if this fuse is blown?
A—The unit will not develop normal power.

Main Battery Switch

(Manual 2310, page 311)

G307-Q—Where is the main battery switch located?
A—On the distribution panel.

G308-Q—What does it connect?
A—This switch connects the 32 cell, 64 volt, 426 ampere hour capacity (8 hour rating) battery to the low voltage circuits.

G309-Q—Where is the connection for charging the battery externally?
A—An external charging receptacle is located on the left side of the locomotive.

Battery Ammeter

G310-Q—Where is this ammeter located and what is its function?
A—The battery ammeter is visible through an opening on the front side of the electrical cabinet and shows whether the battery is charging or discharging.

G311-Q—Normally, what does the meter indicate?
A—Zero, or a slight charge.

G312-Q—What must be done if a continual discharge is shown?
A—The auxiliary generator output should be checked. or the battery may run down.

Reverse Current Relay (RCR)

G313-Q—Where is this relay located and what does it control?
A—Located on the low voltage panel, this relay controls the opening and closing of the battery charging contactor (BC).

G314-Q—When does the Reverse Current Relay cause the battery charging contactor to open?
A—When the auxiliary generator voltage drops below that of the battery.

G315-Q—What action is thus prevented?
A—A reverse flow of current from the battery, attempting to "motor" the auxiliary generator.

Battery Charging Contactor (BC)

G316-Q—Describe this contactor and its function.
A—This contactor is an electrically operated switch, connecting the auxiliary generator output to the low voltage system. As stated previously, the reverse current relay controls the operation of the battery charging contactor.

Battery Charging Fuse

G317-Q—What is the purpose of this fuse?
A—To protect the auxiliary generator against any possible overload.

Fairbanks-Morse

Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F270-Q—What is the air pressure to the thermostat and how is it indicated?
A—Seventeen pounds and it is indicated by an air gage below the upper cabinet.

F271-Q—What regulates this pressure?
A—A reducing valve in the line, connected to the main reservoir.

F272-Q—What protective devices are installed?
A—A relief valve set at 19 pounds to protect the temperature control and a drip well and filter is installed ahead of the pressure regulator.

Operation of Temperature Control System

(Bulletin 1706—118-A, page 3)

F273-Q—How are the cooling system controls arranged?
A—The cooling system controls are arranged to provide automatic control of radiator shutters and cooling fans to maintain the desired water temperature.

F274-Q—What air pressure leaves the thermostat with a cold engine?
A—0 psi.

F275-Q—How is the thermostat set?
A—The thermostat, which is mounted with its temperature sensitive element in the cooling water line, is set to increase the air pressure to the step controller as the temperature of the cooling water increases.

F276-Q—What happens as the water temperature rises above the temperature that the thermostat is set at?
A—The air pressure to the step controller gradually increases from 0 to 17 psi.

F277-Q—What action takes place when the air pressure reaches 4 psi?
A—Switch No. 1 of the step controller closes an electrical circuit to energize a solenoid valve which opens the shutters.

F278-Q—What takes place when the air pressure increases to 6 pounds?
A—The contacts of step controller cam-closed switch No. 2 close and the No. 1 fan starts.

F279-Q—When does fan No. 2 start operating?
A—When the air pressure rises to 8 pounds and closes step controller switch No. 3.

F280-Q—When does the No. 3 fan start to operate?
A—When the air pressure rises to 11 pounds and closes step controller switch No. 4.

F281-Q—When does the No. 4 fan start operating?
A—When the air pressure rises to 14 pounds and closes step controller switch No. 5.

F282-Q—How long do the fans continue to operate?
A—As long as the temperature of the cooling water is above the setting of the thermostat. The fans stop operating in reverse order as the temperature drops and finally the shutters close.

F283-Q—Do all the units have this arrangement?
A—No. The 1,600 hp units use only 3 fans, 3 contactors and 4 controller contacts.

Hot Engine Alarm Switch

F284-Q—Where is the hot engine alarm switch located and how is it connected?
A—On the engine water outlet manifold and is directly connected to a water thermal switch.

F285-Q—How does this switch function?
A—If the water outlet temperature exceeds 195 degrees F the switch closes to light the hot engine alarm light (only on unit affected) and ring the alarm bells on all units.

F286-Q—What must be done if alarm comes on?
A—Check for cause and take the engine off the line if necessary.

(Bulletin 1706—118-A, page 4)

F287-Q—Name some of the causes.
A—1. Steam valves open into engine water system or cab heaters; 2. Shutters stuck or closed; 3. Dirty magnet valve; 4. Shut-off cock closed; 5. Fans not running.

F288-Q—In case the fans are not running, what would you look for?
A—Leakage in 17 lb control air lines; defective step controller or a defective thermostat.

F289-Q—What can be done to check for defective step controller?
A—If necessary, rotate by hand to limit of travel so that all contacts are closed.

F290-Q—Name some other causes for hot engine alarm.
A—Water low; defective water pump; restricted water circulation or scale deposits in water system causing poor heat transfer.

Filling Cooling System

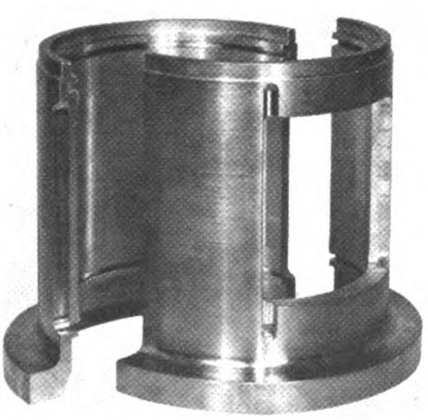
F291-Q—What is the design of the water level?
A—The water level is designed to be below radiators when the engine is shut down, with the same level maintained winter or summer.

F292-Q—What is used to indicate water level?
A—Two 16 in. overlapping sight glasses on the engine water tank indicate water level.

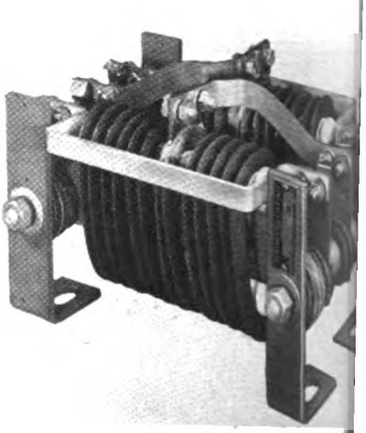
F293-Q—What indicates minimum level?
A—A low level red line indicates minimum level on the lower sight glass, and no engine should ever be operated with water below this mark.

2 **G-E RECOMMENDED CARBON BRUSHES** are selected for the proper degree of hardness and grain structure to minimize wear and provide correct commutation.

3 **G-E MOTOR SUSPENSION BEARINGS** give long life—have an oil-return feature which can save up to $85.00 per locomotive unit annually.



4 **G-E RESISTORS** have floating steel ba bones that expand and contract fre with high-temperature changes and theref are not affected by buckling forces.



SUPPLY TRADE NOTES

(Continued from page 20)

BULLARD COMPANY.—Bullard has released a motion picture called the "Yankee Toolmaker" commemorating its 75th Anniversary. The film shows the growth of industry from colonial times to the present and the part machine tools have played in that growth, with scenes taken at Sturbridge Village, Sturbridge, Mass.; Mystic Marine Museum, Mystic, Conn.; and the Long Island Auto Museum, Southampton, N. Y. It is in full color, 16 mm., sound. Arrangements can be made for showing the film by contacting the Advertising Department of the Bullard Company, Bridgeport 2, Conn. Free loan. Film runs 27 min.

■

HARRISON RAILROAD SUPPLY CO.—*F. B. Harrison, Jr.*, formerly manager of western railway sales for United States Rubber Company, has entered the railway supply field under the name of Harrison Railroad Supply Company, with headquarters at 215 N. Aberdeen st., Chicago.

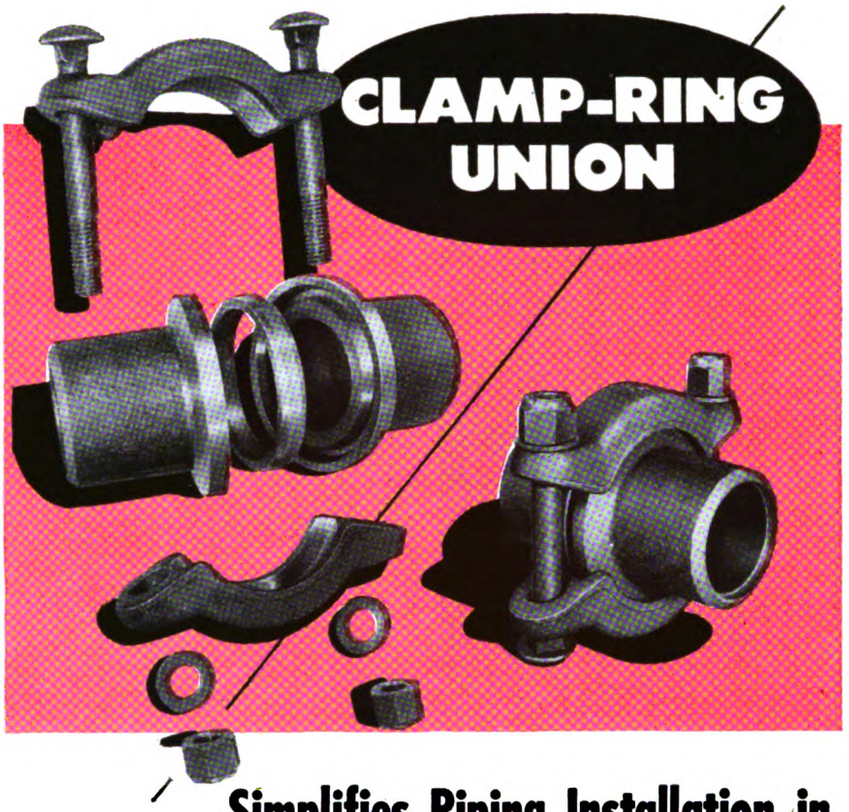
William A. Baldwin

NATIONAL STEEL CORPORATION.—*William A. Baldwin* has been appointed sales manager for Nailable Steel Flooring and other transportation products of Stran-Steel at Detroit. Production and marketing of the steel flooring for railway freight cars, developed by *Great Lakes Steel Corporation*, have been assumed by Stran-Steel whose status as a division of Great Lakes Steel has been changed to that of a separate corporate unit of National Steel, of which Great Lakes also is a unit. Mr. Baldwin has been a Nailable Steel Flooring district sales representative, at Chicago.

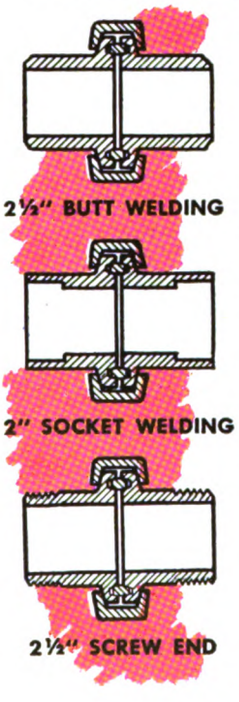
■

TURCO PRODUCTS, INC.—A full color and sound, 23-min 16-mm motion picture, "Flaw Location with Dye Penetrants," has been completed by Turco and is available for free showing to industrial concerns, technical groups and other interested organizations. The film, which is intended primarily for training purposes, visually demonstrates every aspect of dye penetrant inspections from laboratory theory to authentic production-line techniques actually filmed on location during mass production dye penetrant inspections. On-the-spot inspections filmed include the production-line inspection of wing spars and small

WATSON-STILLMAN



Simplifies Piping Installation in Locomotive and Car Heating Steam Lines



Here's the ideal union for locomotive and car heating steam lines. It is readily installed in those hard-to-get-to locations beneath the frame. The clamp can be rotated so that the nuts are in the most convenient position for gripping and turning with a wrench. The union allows the pipe to be pre-fabricated and completely installed in the car frame. When used to join valves with matching ring faces, the W-S Clamp-Ring Union permits easy installation and removal of valves, and allows them to be rotated to any convenient position.

The W-S Clamp Ring Union is presently available in two sizes... for 2" and 2½" IPS pipe. The 2" union has socket-welding ends, whereas the 2½" union is available with butt-welding or screwed ends. Other sizes are available on application.

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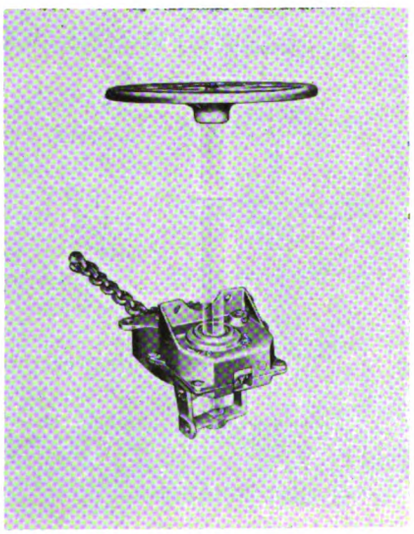
parts at Northrop Aircraft, Inc.; the inspection of truck wheels and valves on the Union Pacific, the inspection of oil-tool components and aircraft gears at Sargent Engineering Corp.; the inspection of spindles at a bus lines company and the inspection of pressure vessel weld seams at Vulcan Pipe and Engineering Company. The laboratory sequence describes the theory behind dye penetrants in detail and outlines the proper methods of assuring complete inspection accuracy. A laboratory inspection is performed on glass microslides which have been fastened together to simulate a defect. In this sequence, the viewer is enabled to see exactly what action takes place when flaws are located in metal parts with dye penetrants. Arrangements for viewing the film or additional information may be secured by writing to Turco Products, Inc., 6135 South Central avenue Los Angeles 1.

NEW DEVICES

(Continued from page 6)

filter-equipped units and checking the comparative results. A little over 100,000 miles of such comparative operation showed that there was no appreciable difference in the oil analysis between the two different types of cleaning equipment. *Electro-Motive Division, General Motors Corporation, La Grange, Ill.*



Drop-Shaft Hand Brake

This Peacock non-spin horizontal-wheel drop-shaft hand brake is designed for application to flat cars. To set the brake, the wheel is turned clockwise when looking down on it. Using only half this force and rotating the wheel counter-clockwise releases the brake. It can be released even though the brakes are held by an emergncy air application. There is no pawl or trip.

The hand wheel and brake shaft can be raised or lowered when the brake is either set or released. All rotating parts are fitted with oilite or bronze bushings. Without the drop shaft, weight is approximately 70 lb. The brake has 20-in. of chain travel. It

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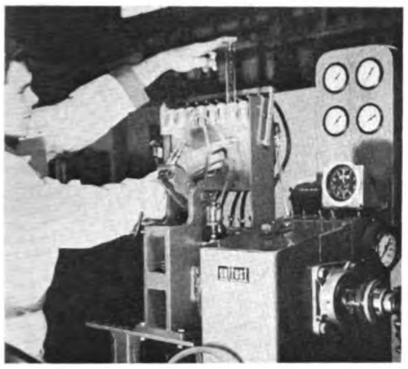
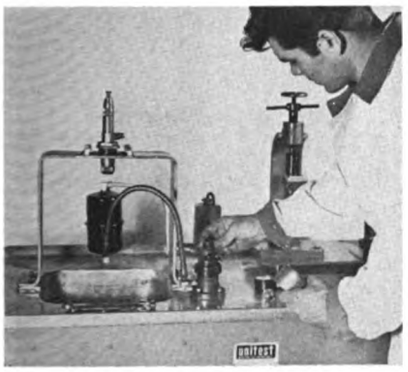
nas been tested and approved by the AAR. *National Brake Company, 30 Church street, New York 7.*



Fuel pump calibrating stand



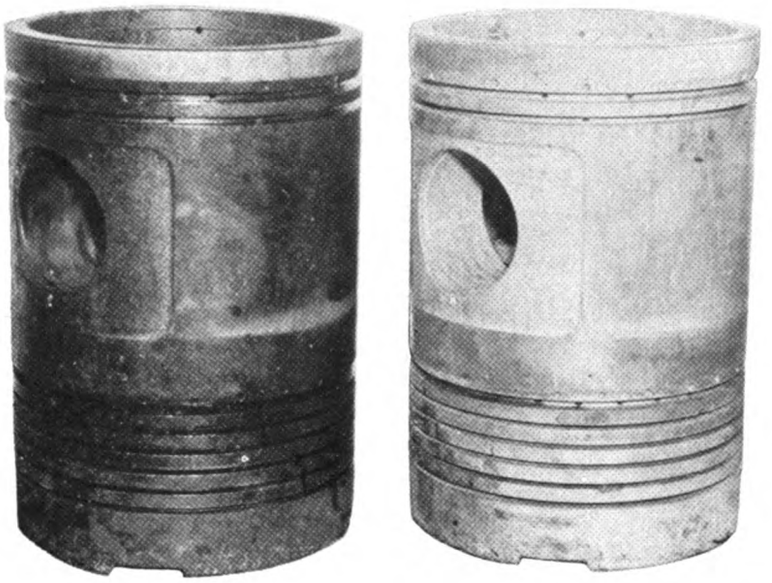
Nozzle test and wash stand

Fuel Injection Equipment Testers

Testers which can be adapted to handle the fuel injection equipment of a number of builders are available for shops that must service various diesel engines. The Unitest fuel pump calibrating stand can be adapted for testing Bosch, Caterpillar, Cummins, Demco and International pumps, and General Motors Series 71 pump-injectors. This stand is equipped with two driving shafts and two groups of graduate tubes to permit the calibration of one pump while a second is being set up for testing, or to handle pumps with couplings on either left or right side. A Worthington all-speed drive simulates engine speeds from 150 to 3,000 rpm and a stroke counter registers either direction of rotation. A pre-set tripping mechanism automatically disengages the fuel discharge bar after the required number of strokes has been collected in the graduate tube.

A companion unit is the Unitest nozzle test and wash stand. This unit will hold fixtures for Bosch, Caterpillar, Cummins, Demco, and International injectors. Testing pressure is applied through a hand-operated pump which includes a Bosch final stage filter. Washing oil is electrically pumped at 30 psi pressure to a flexible hose near the holding arbor, and to a slide-valve operated nozzle tip wash unit. *Diesel Control Corporation, Wilmington, Cal.*

YOU can clean it FASTER with LIX!



All ferrous and non-ferrous parts are cleaned faster in a soak-tank with a minimum of labor. Lix Diesel Klean Heavy is a concentrate, and can be reduced effectively with mineral spirits. It will not corrode or damage any highly machined parts. It will not polute sewerage systems, streams, rivers, etc. *Lix can help you speed up your cleaning jobs.*

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Write today for your booklet telling how to use Lix cleaner . . . or better yet, ask for a Lix representative to demonstrate in YOUR shop. No obligation of course.

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Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information. Requests will be forwarded direct by the manufacturers.

1. HIGH STRENGTH STEEL. *U. S. Steel.* 174-page working handbook "Design Manual For High Strength Steels" for architects and engineers, to fill need from widening applications of high-strength low-alloy steels.

2. RINGS. *Precision Piston Rings.* 8-page 2-color brochure "Precision Un-Breakable Wrought Alloy Piston and Sealing Rings" gives technical data and complete descriptions of the physical properties of the eight alloys used.

3. AIR COMPRESSOR. *Ingersoll-Rand.* 4-page flier (3188) "A New Size Type 40 Motorcompressor 125 Horsepower Two-Stage Air-Cooled 80-125 psi" describes, illustrates and gives dimensions for the new electric-driven air compressor.

4. ROTARY BLOWERS. *Miehle-Dexter Supercharger Div. Dexter Folder Co.* 6-page bulletin (255) illustrates and describes the versatility of application for M-D Rotary Blowers for all industrial products and processes, pressure or suction.

5. PIPE MARKERS. *North Shore Nameplate Inc.* 4-page catalog describes and shows uses of the Speedy-Marx Self-Adhesive Pipe Markers, an identification marker system using pressure-sensitive tape.

6. REFRIGERATION VALVES. *A-P Controls Corp.* 20-page 2-color catalog (W-S-3) "Dependable Refrigeration Valves, Filters, Driers" describes and illustrates the entire A-P line, includes charts, selection data, capacity tables on each.

7. WELDING PUBLICATIONS. *Air Reduction.* 16-page booklet "Airco Publication List—April 1955" lists over 100 welding and cutting technical reprints, text books, safety booklets, slidefilms and movies available; includes keyed order forms.

8. SELF-LOCKING NUTS. *National Machine Products.* 24-page brochure "Huglock, Self-Locking Nuts" contains engineering data, specifications and price list.

9. ARC-WELDING ELECTRODES. *American Welding Society.* 20-page specification pamphlet "Tentative Specifications for Low Alloy Steel Arc-Welding Electrodes" classifies electrodes by both chemical analysis and mechanical properties.

10. ADJUSTABLE-SPEED DRIVE. *General Electric.* 8-page 2-color brochure (GEA-6234) "New Thy-Mo-Trol Drive, General Purpose, Full Wave" describes, illustrates and gives specifications for the Thy-mo-trol adjustable-speed drive.

11. TAPES. *Bishop Mfg. Corp.* 8-page 2-color catalog (455) "Tapes For Sealing, Splicing, Jacketing, Insulating" describes, illustrates, gives properties and recommended uses, and illustrates typical applications of the company's major tape products.

12. HOSE FITTINGS. *Parker Appliance Co.* Four 3-hole punched catalog file sheets (4480A, 4484A) describe, illustrate and give specifications for rubber covered single fiber braid (non-metallic) hose for low pressure service and brass re-usable fittings for this hose.

13. ADHESIVES, COATINGS, SEALERS. *Minnesota Mining & Mfg. Co.* Illustrated folder describes the use of "3M Brand Adhesives, Coatings and Sealers" for joint-sealing, and bonding and protecting sheet metal; includes applications for nine of the company's materials.

14. WORK HOLDING EQUIPT. *Jergens Tool Specialty Co.* 64-page catalog (101) describes, illustrates and gives specifications on the complete line of Jergens Work Holding Equipment and Jig and Fixture Components.

15. STEEL PUBLICATIONS. *Allegheny Ludlum Steel.* 16-page pocket-sized folder "Publication List" describes literature available without charge on selection, fabrication and application of stainless and heat-resistant steels, tool and die steels, electrical steels and alloys, and carbide materials.

16. SANDBLAST EQUIPT. *Clementina Ltd.* 20-page catalog "Sandblast With Clemco" describes and illustrates 14 different models from 150-lb. to 1350-lb. sand capacity; includes latest accessory items.

17. MOBILE FLOOR CLEANER. *Handling Devices Co.* 2-color bulletin (551) "Which Will Clean Your Floors Faster, Better, More Economically . . . and Control Dust" details features of Floormobile for suction cleaning large floor areas; includes case history material.

18. HIGH STRENGTH STEEL. *Republic Steel.* Two 4-page folders (667, 668) give data, including chemical composition, mechanical properties, rolling limits and practices, on Republic "50" High Strength Steel and "65" and "70" High Strength Alloy Steels.

Reader Service Department **AUGUST, 1955**
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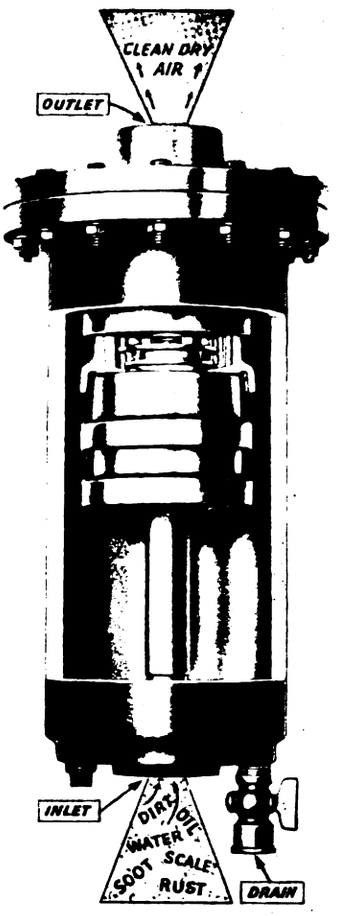


Maintenance-Free Air Separator

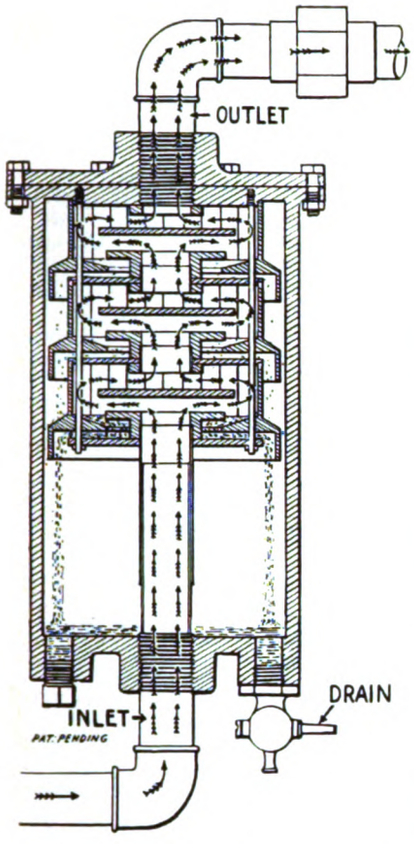
A new design of compressed air separator has been under test in yard air lines where it has effectively cleaned compressed air of water, oil, dirt, scale, cinders and other elements harmful to air-operated equipment.

A feature of this device, known as the Textite Air Separator, is an arrangement of cleaning elements which removes unwanted by-products of compressed air without the aid of moving parts to wear, or filter elements which must be cleaned or replaced. Only the air stream moves throughout the unit. A combination of centrifugal action, jetting, sudden expansion, capillary attraction and scrubbing removes the contaminants.

The air moves through a series of elements as shown on the drawing. It enters each element at the center and flows outward through spiral vanes. It then makes a sharp reversal and passes upward to the center of the next element.

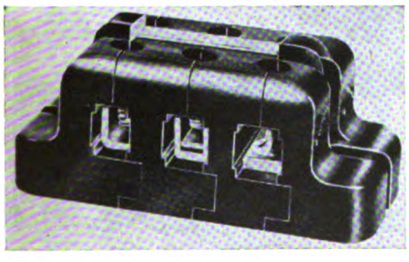
The water droplets removed from the air drop down along the inside of the casing for collection and removal. Thus no re-evaporation occurs because the air being cleaned does not come into contact with the water that has already been removed.

Because there are no filtering materials there should be no maintenance or servicing required other than draining the col-



lection chamber. The separator can be used with pressures up to 150 lb. It should be installed some distance away from the compressor to minimize the effect of pulsations.

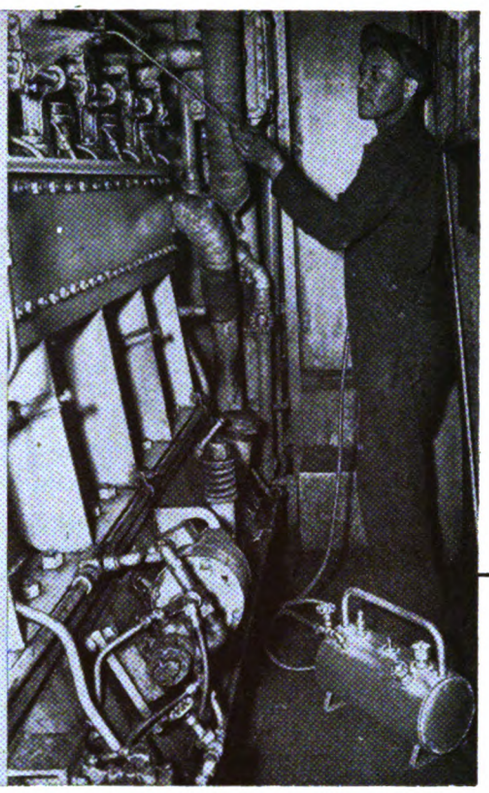
The separator removes only water in liquid form—not the vapor that makes up the humidity content. Therefore, it must be installed beyond the after-cooler, so that the temperature of the air passing through the separator will not be appreciably higher than the temperature of the air will be where it is used. In this way, any water that is to condense out will have done so and can be removed by the separator. *Chicago Railway Equipment Company, 332 South Michigan avenue, Chicago.*



Sectional Terminal Block

Terminal blocks can be built up of any number of individual circuit sections. Adjacent sections are joined by three integrally-molded serrated pins mating with corresponding holes. This press-SURE-pin design is claimed to give one-piece ruggedness to the complete assembly that can be of any length. Every circuit section is com-

Cut Time in Cleaning Diesel Interiors



Cleaning the engine exterior, floors and walls need not be a time-consuming job. You can cut the time and manpower requirements of the job with Diesel Magnusol.

Safe and Sure

Diesel Magnusol is a fast-working cleaner, easily applied. You just mix the concentrated cleaner with water, and spray it on all surfaces to be cleaned. After it has soaked in for a short time, flush the cleaner and dirt away with water, leaving really clean surfaces. Diesel Magnusol is harmless to paints, to metals and to personnel. It is non-toxic and non-flammable.

For Very Dirty Jobs

. . . such as the interiors of switchers, mix Diesel Magnusol with safety solvent instead of water, but on road engines where a regular cleaning routine has been followed, Diesel Magnusol with water is all you need.

USE DIESEL MAGNUSOL FOR A MONTH

Order a trial drum. Use the Diesel Magnusol, as directed, for a month. If you are not completely satisfied at the end of the month, we will cancel the full invoice.

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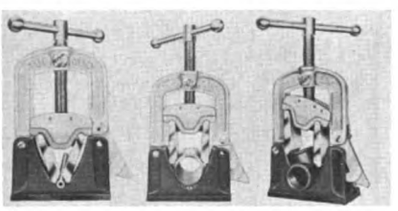
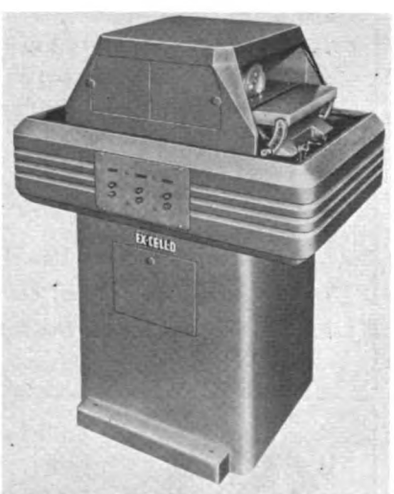
pletely surrounded by the molding material and has a factory installed contact that is plated with electrolytic copper and has a positive wire stop.

Three contact types are available for stripped or terminal-ended wires over the range from No. 18 to No. 4 wire. With the maximum wire size installed in any contact type, the contact screws never project above the upper surface of the block. Individual press-fit circuit sections can be factory assembled, or can be built up by the user with pneumatic or manual assembly fixtures. Slip-fit sections are available for hand assembly. This sectional terminal block has a rating of 70-amp and 750 volts. *Buchanan Electrical Products Corporation, Hillside, N. J.*



Pipe Vise

Rocking wedge jaws in this pipe vise are claimed to provide firm gripping action without crushing or marking pipe. Heat treated jaws and rugged construction are featured in this heavy-duty tool. It is stated that the jaws are versatile enough to securely grip pipe from ⅛ in. to 2½ in., and irregular shapes such as valves, tees, and other fittings. *Toledo Pipe Threading Machine Company, Toledo.*



Tool Grinders

Precision grinders with 6-in. wheels to heavy-duty machines with 14-in. wheels complete a line of four new Ex-Cell-O tool grinders. Each model is double-ended with a reversible motor for proper wheel rotation for both left- and right-hand tools. Grinding is done on the face of the plate-mounted wheels to give straight surfaces and accurate tool angles.

Tool rest tables are large enough to support tools firmly and are adjustable to the required tool angles. They also adjust toward the grinding wheels to compensate for wheel wear. Wheels are guarded, and the models equipped for coolant have splash guards. Silicon-carbide, aluminum-oxide or diamond wheels can be used to grind carbides, cast alloys, or high-speed steels. Wheels of two different types can be mounted on the two ends of a single machine.

The smallest model, the precision grinder Style 44-A, is especially suited for grinding carbide tools with diamond wheels. It is equipped with a coolant system. The largest model, Style 49-A, frequently is used for roughing operations, but is suitable for finishing large tools made from high-speed steels. *Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 32.*

Thread Inserts

Left-hand stainless-steel wire thread inserts are available in 20-thread, 7/16-in. and ½-in. diameters, also a kit for the repair of automotive type spark plug threads. The range of kits now supplied will repair threads from No. 40 to 1½-in. diameter. The kits include the inserts, and the tap and inserting tool packed in a sturdy container. *Heli-Coil Corporation, Danbury, Conn.*

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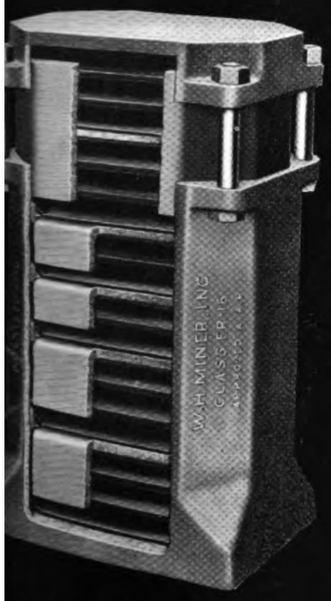

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Founded in 1832 as the American Rail-Road Journal

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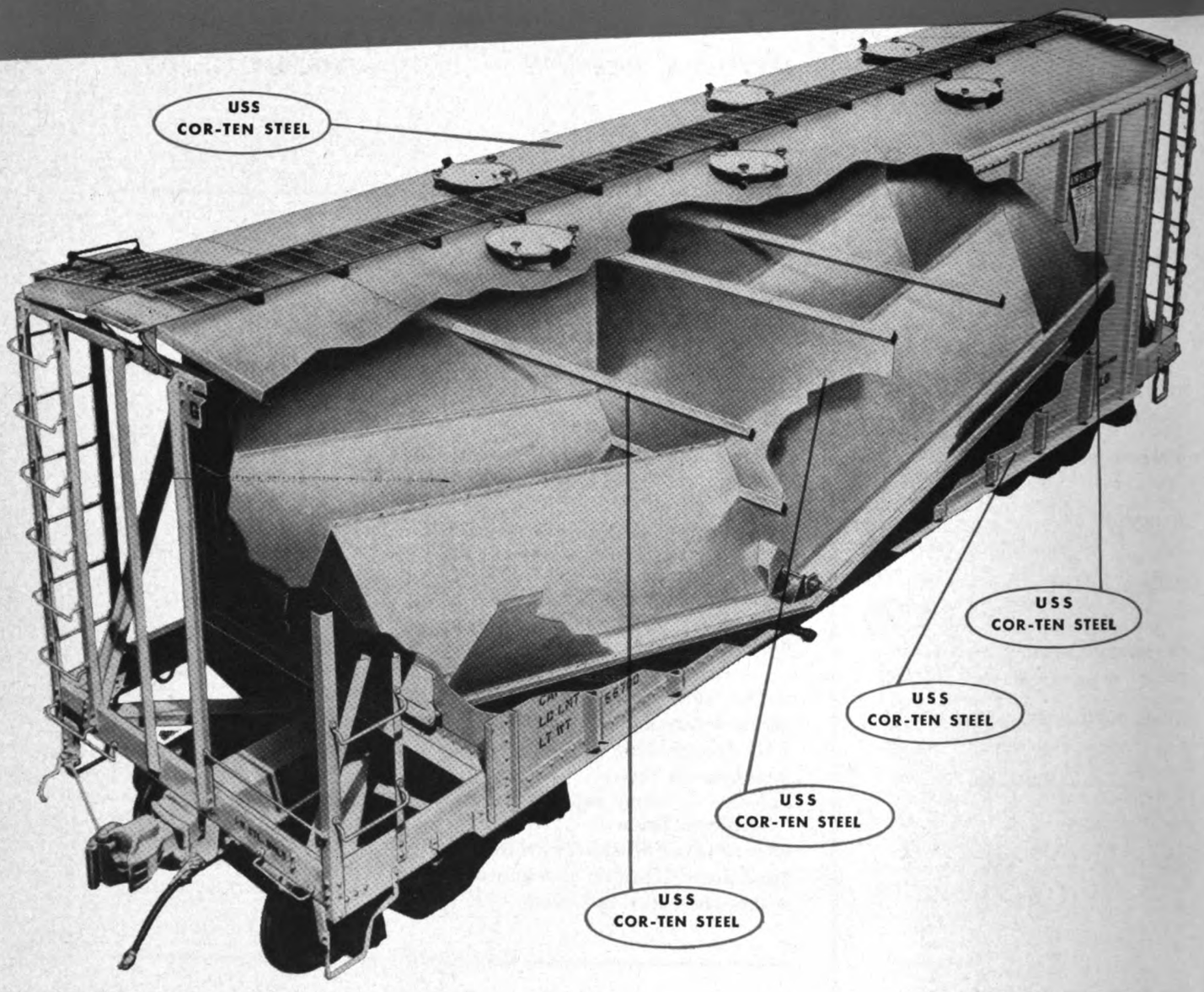

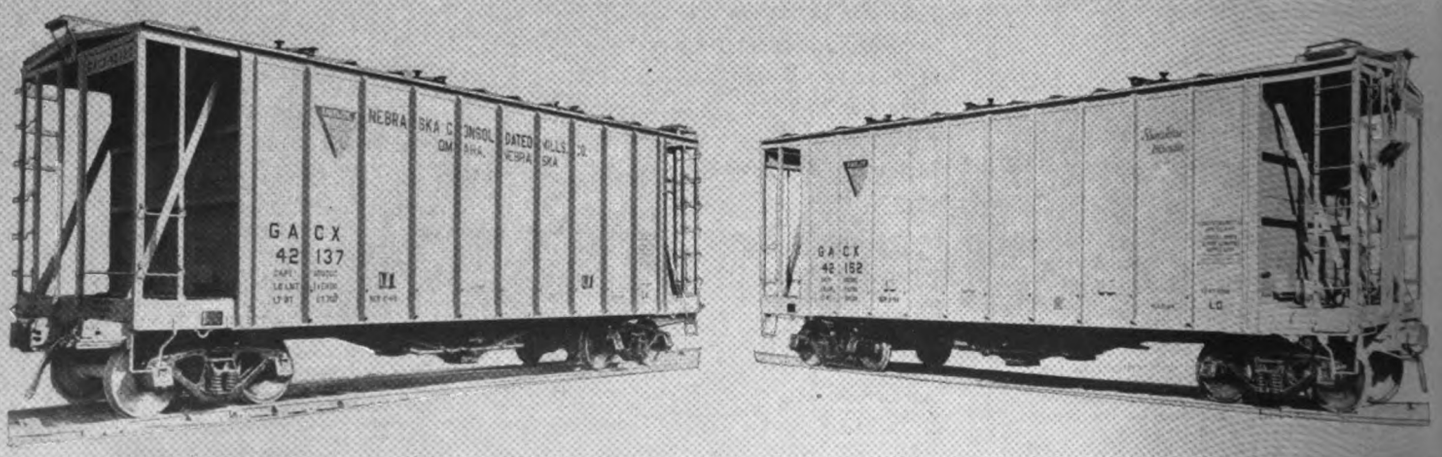

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better with USS COR-TEN Steel since 1933

In General American's new AIRSLIDE® cars

USS COR-TEN Steel

was selected to minimize corrosion and keep maintenance costs low

The increased demand by shippers of dry, granular, and powdered bulk materials for a special car that would protect the lading and be easier to unload has been answered by the General American Transportation Corporation, Chicago. It's the new AIRSLIDE Covered Hopper Car.

How well the AIRSLIDE car fills the bill can be deduced from the fact that since its introduction less than two years ago, more than 600 are today in service or on order.

Shippers who hitherto have not found bulk handling feasible are now using these cars and are realizing substantial savings in container, dunnage and labor costs. Improved sanitation and reduced damage from contamination are additional advantages these shippers appreciate.

To solve the difficult problem of high-speed unloading, the GATX engineers have utilized the Fuller* Airslide principle by which the lading is aerated and fluidized, causing it to flow like water to the double hopper doors.

They selected USS COR-TEN Steel for car construction for two reasons: (1) to obtain high strength with no increase in weight, and (2) to reduce interior corrosion, caused by condensation, to a minimum.

USS COR-TEN Steel's high yield point of 50,000 psi. and its high resistance to atmospheric corrosion, 4 to 6 times that of carbon steel, made it a logical choice on both counts.

COR-TEN Steel's high corrosion resistance plus the fact that paint adheres more tightly to it are further assurance that these AIRSLIDE cars will maintain their attractive appearance longer and will better resist the attack of atmospheric corrosion both inside and outside.

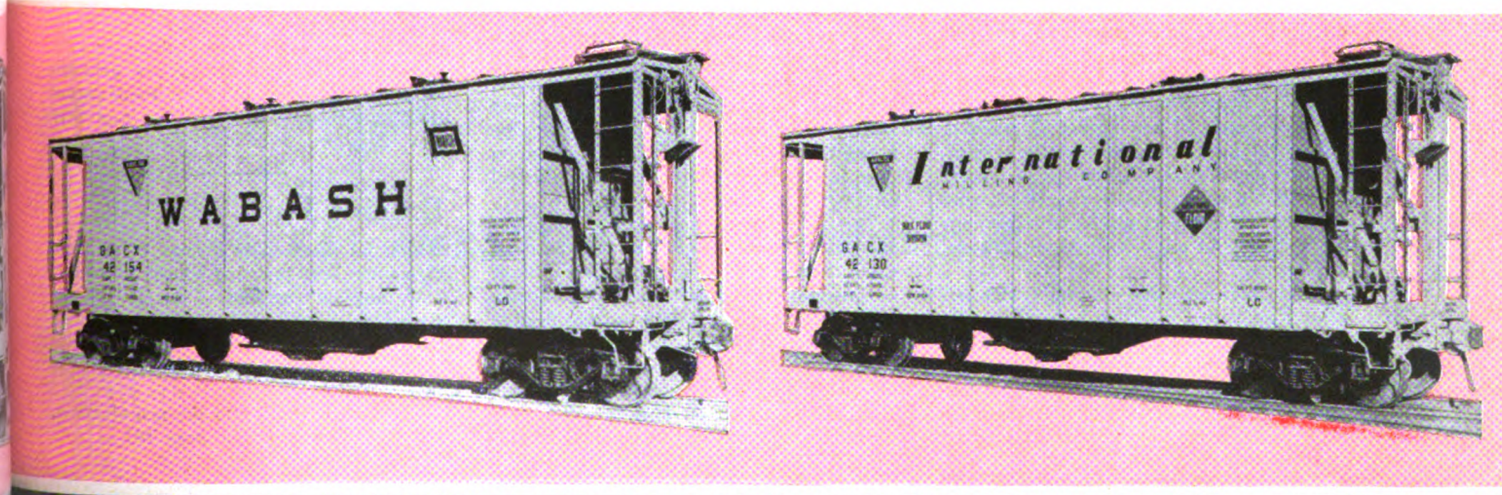
By combining a unique car design with superior COR-TEN Steel construction, the builders of the AIRSLIDE car have made available to shippers an efficient means for transporting commodities never successfully handled in bulk before—and a car that can be confidently counted on to render long time service with the least amount of maintenance.

Find out how readily USS COR-TEN High Strength Steel can be adapted to your designs. Our engineers who pioneered its application in freight equipment of every type can place at your disposal an unequalled experience in its use that cannot fail to be helpful. We welcome your inquiries, and the opportunity to work with you.

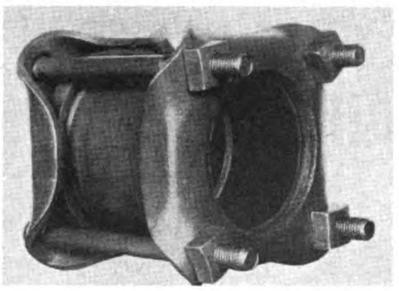
(*The Fuller Company: A subsidiary of General American Transportation Corporation.)

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



UNITED STATES STEEL



The flexible coupling is made in sizes to over 24-in.; the flexible fitting (right), in sizes from ⅜ to 2-in.

Flexible Couplings and Fittings for Diesels

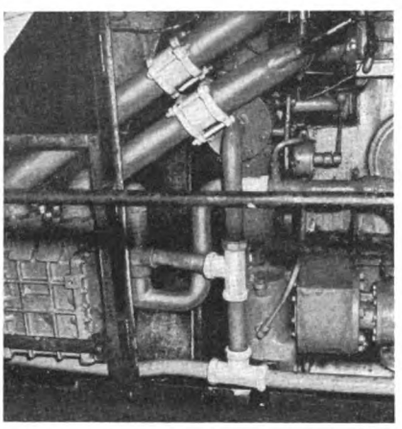
Two years ago the mechanical department of the Erie first began testing flexible pipe couplings for their diesel locomotives. The results of their year-long test encouraged the Erie to begin replacement of all rubber hose connections.

The end of the first year of conversion found 30 per cent of Erie diesels equipped with flexible pipe couplings. Not one leak had occurred on pipe joints connected with flexible couplings and there had been no locomotive failures or delays resulting from leaking joints. Not one coupling or fitting had to be replaced after installation. A saving of about $50 per locomotive per year on material costs resulted. Erie estimates a total yearly saving of $20,000 when all diesel piping has been converted.

The success of Erie's conversion program is presently being duplicated by similar programs on other railroads. They are changing to flexible couplings for joining piping on all types of diesel locomotives. The couplings chosen by Erie for their initial test and subsequently installed on their diesels, were furnished by the Dresser Manufacturing Division of Bradford, Pa. The Erie used, two basic products, couplings and fittings. Both operate on the same principle—the compression of specially compounded rubber gaskets to effect a permanent, bottle-tight seal. The main difference lies in the method of attaining this compression.

The Dresser couplings consist of a cylindrical steel middle ring, two resilient gaskets of special compound, two steel follower rings and a set of high-strength steel trackhead bolts. The follower rings confine the outer ends of the gasket. Tightening the bolts, which extend through these rings, compresses the gasket in the spaces formed by follower rings, middle ring flares and the pipe surface to form the seal. Couplings are available in sizes ⅜-in. through 24-in. and larger.

The fittings are made especially for small piping ⅜-in. to 2-in. They have essentially the same parts as the couplings. The fitting body corresponds to the middle ring; there are two gaskets with retainer cups to confine them, and threaded end nuts in place of the bolts. When the end nuts are screwed on the threaded body they compress the gaskets to make a bottle-tight seal.

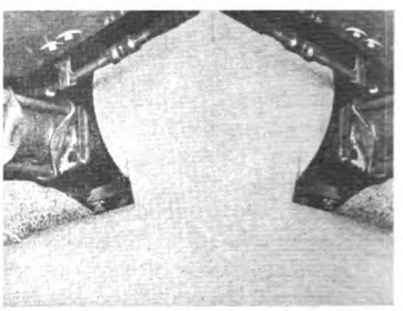


Relocation of heat exchanger on a Baldwin 600-hp switcher was done with the aid of Dresser fittings.

The Erie quickly learned that the great advantage of couplings and fittings for diesel piping lies in their strength, ease of assembly and flexibility. The high-strength steel or malleable iron bodies will easily withstand pressures of 150 psi with an ample safety factor. In Dresser couplings and fittings the specially compounded gaskets which are the only parts in contact with the pipe actually float in the joint. This absorbs vibration in the line and allows up to 6 degrees of misalignment. Flexible pipe couplings and fittings take up expansion and contraction caused by diesel operating temperatures and changing weather conditions. Since no exact pipe fitting or threading is required, installation time is kept to a minimum. The only tool required is a wrench.

The Erie found that flexible couplings and fittings are more than replacement parts. Now major diesel piping relocations to provide greater efficiency and serviceability are practical because of the flexible couplings and fittings. An example in the Alco 1600-hp road freight locomotive is the oil system which has been changed from a parallel to a series hook-up. Standard plain-end pipe was cut to nominal lengths and connected with Dresser couplings and fittings. These not only eliminated exact pipe fitting but also provided the required flexibility and greater strength in steel pipe and steel connections.

Piping changes in the oil system of a 1,600-hp Alco freight unit included the use of Dresser couplings.



Engine-water outlets to radiators on an EMD unit were changed with a special Y fitting including couplings.

Similar benefits were realized on Baldwin 600-hp switchers where relocation of the heat exchanger necessitated piping changes. On EMD Locomotives, the "Y" connection from the engine to the radiators has often been a trouble spot because of the excessive vibration and high temperatures. Dresser developed a special coupling for the Erie to use at this spot which has been adopted as standard after testing.

These are but a few ways that flexible couplings and fittings have helped the Erie. These couplings and fittings are presently being installed by other railroads across the country. *Dresser Manufacturing Division, Bradford, Pa.*

Brazing Flux

A flux for silver alloy brazing of stainless, chromium heat resisting alloys, chromium and tungsten carbides, Type B-1, is designed to reduce oxides of the refractory metals while protecting the underlying metal from further oxidation during brazing.

The flux, according to the manufacturer,

(Continued on page 10)

simulated the weather

on the

GREAT AMERICAN RAILWAY
System

Weather wages war on freight cars. In their lifetime most box cars encounter all of the extremes many times as they are shuttled back and forth over the 402,603 miles of track that make up the Great American Railway System.*

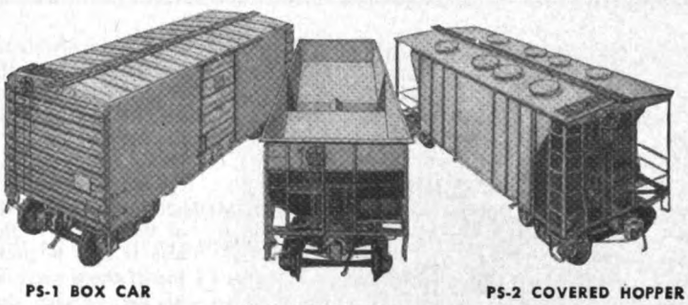
To know exactly how the PS-1 Box Car will perform in cold areas, a sample car is frequently impact tested, in the laboratory, with its welded draft lug and bolster assembly packed in dry ice. To assure superior performance wherever it goes, PS-1 materials and construction samples are proved in accelerated life tests under intermittent sun-like infra red rays and showers of corrosive salt sprays.

These and the many other laboratory findings are augmented by "on line" reports of Pullman-Standard's sales and service engineers. They study the success and failures of all types of construction on cars of all makes. Their reports contribute to the design and building of cars that will successfully meet today's and tomorrow's operating conditions and requirements.

Like the PS-1, the PS-2 Covered Hopper Car and the PS-3 Hopper Car are quality cars efficiently built to produce more ton miles of revenue at the lowest cost per year of service. If you are interested in the modern trend in freight car construction write for booklets describing these cars.

*A typical box car moves, in one year, on 39 different roads, including two or more trips on 24 roads. (A.A.R. data)

Built to serve best on the



PS-1 BOX CAR

PS-3 HOPPER CAR

PS-2 COVERED HOPPER

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BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

(Continued from page 6)

has an ability to withstand heating at 1,400-1,600 deg F for short periods and to increase its life at lower brazing temperatures. It contains a strong deoxidizer to regenerate the flux during heating cycle.

Among other applications are its use with AMS 4772 brazing alloy, flow point 1,515 deg F, for brazing jet engine compressor blades. *Handy & Harmon, 82 Fulton street, New York 38, N. Y.*

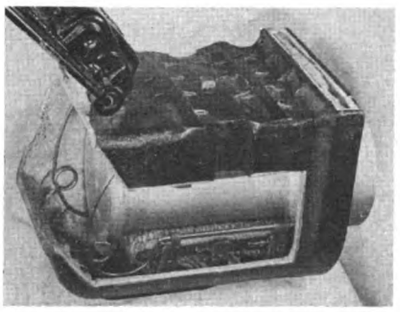
Variable-Delivery Gear Pump

This variable-delivery gear pump, Model FV1, can be adjusted to deliver lubricant at any rate from 3.5 to 10.5 gph. Rate of flow can be controlled while the pump is operating by moving the regulating screw by hand, or automatic control can adjust output in stages of 1.5 gph. Positive delivery is accomplished without throttling. It is claimed that there is constant and uniform delivery with lubricants of different viscosities, and that little heat is generated during pump operation. Designed for rotary drive, the pump is 2⅝ x 3⅛ x 3½ in. *Nathan Manufacturing Corporation, 45-02 Ditmars Boulevard, Long Island City 5, N. Y.*

Dry Chemical Fire Extinguisher

A new 10-lb pressurized dry chemical fire extinguisher carries underwriters' approval for a pressure range of from 150 to 250 lb. The advantage of such a wide range of working pressures, according to the manufacturer, is that the unit will work satisfactorily if only 150 lb of air pressure is available. When pressurized to 250 lb the extinguisher packs an extra hard hitting punch.

The unit features a pistol grip trigger release mechanism; a new dust and moisture-proof gage which shows at a glance the unit's charged pressure; and a diffuser horn which gives extra wide coverage of the discharge pattern to make the most efficient use of the dry chemical. *Walter Kidde & Co., Belleville, N. J.*



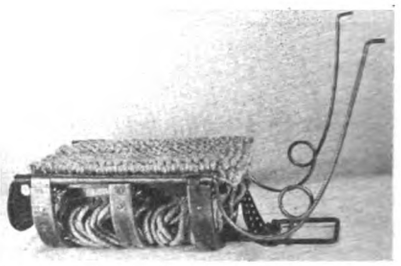
The Rolin lubricator in an AAR standard journal box.

Rolin Lubricator

The Rolin journal lubricator, which has successfully passed AAR acceptance tests and been applied to about 500 freight cars on 35 U.S. railroads, is a pad-type lubricator, widely used as standard equipment on European roads and adapted to American operating conditions by extensive research in this country during the last two years.

The device consists of a flexible steel framework which holds a lubricating pad in constant contact with the lower surface of the journal to apply and distribute the lubricant. Conduction of the oil from the reservoir in the lower part of the journal box to the surface of the lubricating pad is by capillary action. Provision is made to retain oil by means of a splash guard in the rear of the box, but the pad itself is said to hold sufficient oil to maintain proper bearing temperature for approximately 3,000 miles if for any reason the reservoir oil is lost.

A special textile cord is used in the lubricating pad, both for the feeding cords and for the loops which form the top surface of the lubricating pad. Around the inner filling of the cord is a covering of other textile materials, the purpose of

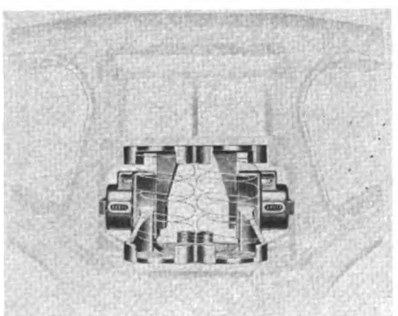


How special textile oil-feeding cords are applied in the lubricator.

which is to feed the oil from the inner filling to the journal and to prevent particles of the inner filling from becoming detached and clogging the bearing. In addition, the outer covering prevents glazing of the softer material of the inner lining.

The loop construction of the top of the pad also is designed to prevent glazing by permitting metal particles, dust and dirt to drop down where they cannot interfere with the oil flow or form a crust on the upper surface of the pad. It is said that the pad will not absorb water after once being soaked in oil, thus eliminating any possibility of freezing.

Advantages claimed for the Rolin device include: reliable and relatively low-cost lubrication of car journals without interruption due to waste grabs, glazing, or other interruption of oil supply; high oil-feeding capacity, up to 2.23 ounces per hour at 50 mph; ease of application in all standard journal boxes without jacking, special tools or skilled mechanics; convenient removal and inspection of the wedge and bearing without taking out the lubricator itself; reclamation and re-use after 100,000 miles of service, the equivalent of at least 36 months between repacking periods; practically no servicing; and important savings in oil, labor and maintenance costs. *Runknagel & Nichols, Inc., 165 Broadway, New York 63.*



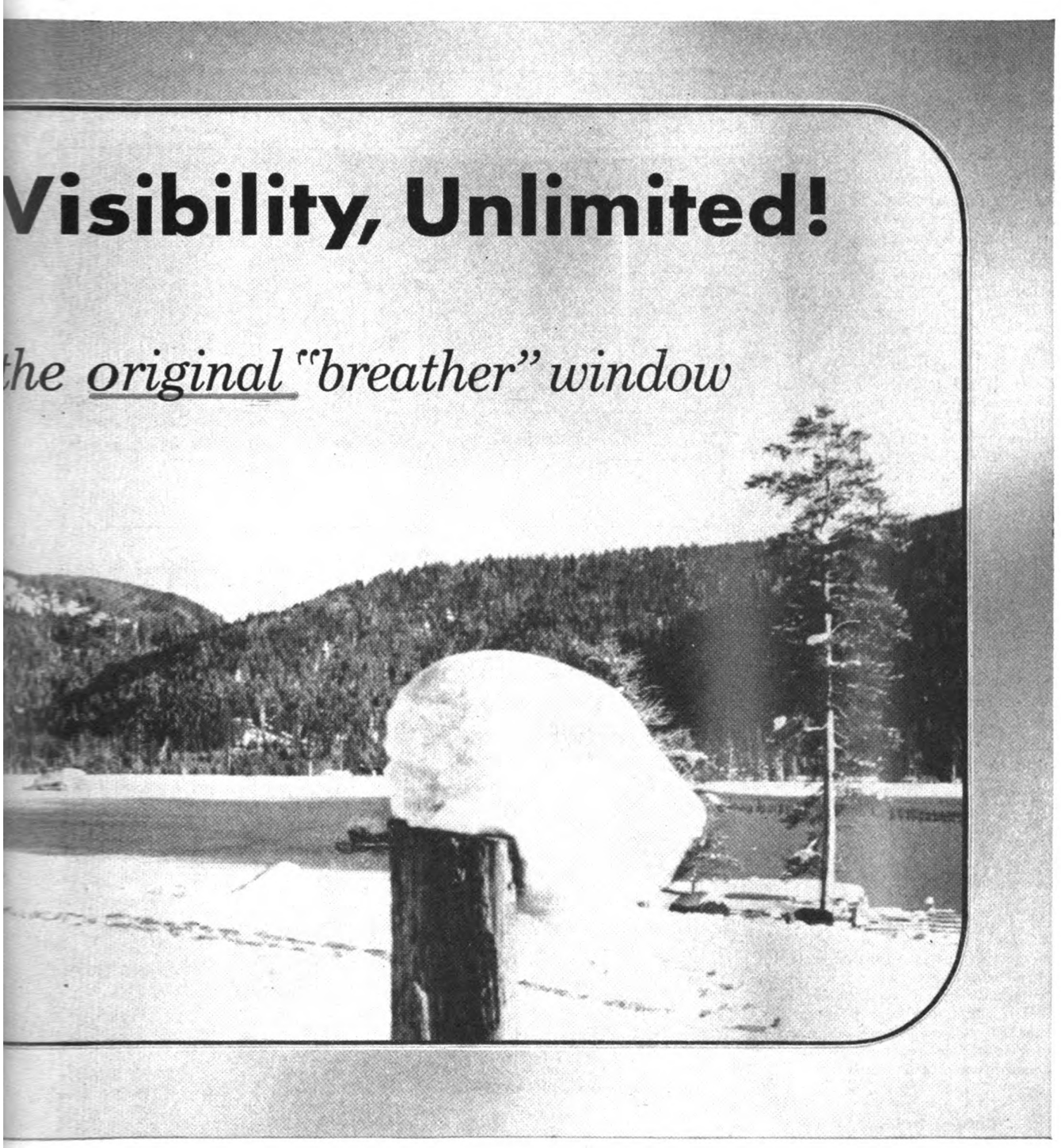
Stabilizer Package

A ride stabilizer package that has no wedges or wedge action and bears against the vertical surfaces of the bolster spring opening below the column guides can be applied to double-truss side frame trucks either with or without spring planks. It is claimed that because there is no wedge action, this device is smooth acting at all times and that the danger of sticking is eliminated.

There is space to use five standard AAR spring groups in the side frame because of the design of this package. Its design also is said to prevent longitudinal shifting of the device. The top control portion of the package does not nest into the bottom control portion and this is intended to prevent failures caused by heavy lateral shock or lateral roll. There is three-way control of bolster movement and the unit should maintain the "squareness" of the truck.

To install, the package is positioned in the side frame after the bolster has been inserted and raised. Compression wedges

(Continued on page 22)



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NEWS

Equipment Orders As of July 1

Class I railroads installed 599 new locomotive units during the first six months of 1955, of which 590 were diesel-electric units and nine were electrics, the Association of American Railroads has announced. In the first half of 1954, Class I roads installed 788 new locomotive units, including 781 diesel-electrics and seven gas turbine-electrics.

New locomotive units on order by Class I roads on July 1 totaled 470, compared with 124 on order on the same 1954 date. On order this July 1 were 469 diesel-electrics and one electric, while those on order a year ago included 106 diesel-electrics, 10 electrics and eight gas turbine-electrics.

The serviceable freight-car fleet totaled 1,614,414 cars on July 1, as compared with 1,609,989 on June 1. The July 1 figure becomes 1,692,834 when cars owned by car-line affiliates of the Class I roads are included. The backlog of orders on that date totaled 27,848 cars.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,706	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788

Senate Confirms Hall For Loco. Inspection Post

Rejecting an adverse report of its Committee on Interstate Commerce, the Senate on July 29 confirmed President Eisenhower's appointment of John A. Hall as director of locomotive inspection at the Interstate Commerce Commission. The vote was 43 to 41.

A former special assistant to the grand chief engineer of the Brotherhood of Locomotive Engineers, Mr. Hall has been serving in the ICC position since last October on the basis of an interim appointment.

N&W To Construct New Car Shop at Roanoke

The Norfolk & Western plans to construct a new car shop facility at Roanoke, Va., to replace completely the present facility. The new installation will cost over $1 million and will occupy a ten-acre site extending some 1,800 ft from the entrance to the present Roanoke shops. It will be equipped with three 100-ft-wide crane bays —600 ft, 660 ft and 450 ft long, respectively —and a 100 by 180 ft fabricating shop at the west end of the 660-ft bay. The facility will be serviced by overhead and gantry cranes for handling material on and off major fabricating machines. The shop will be equipped to repair and build all types of freight cars.

PERSONAL MENTION

Baltimore & Ohio

FRANCIS B. RYKOSKEY, appointed general superintendent of motive power and equipment at Baltimore. A photograph and sketch of Mr. Rykoskey's career appeared in the June issue at the time of his appointment as assistant general superintendent of motive power and equipment.

Canadian National

G. E. MACCALLUM, master mechanic, Edmundston division, transferred to Island division at Charlottetown, P.E.I.

H. E. MOORE, master mechanic Island division at Charlottetown, P.E.I., retired.

J. A. H. BOURDEAU, road foreman of engines, Edmundston division, appointed master mechanic of the division, with headquarters at Edmundston, N.B.

Erie

Central Region

E. R. STICKEL, assistant foreman, Erie enginehouse, Northern division, appointed assistant foreman—special duty, office of general superintendent—motive power, at Pittsburgh.

Chicago & North Western

J. E. GOODWIN, vice-president in charge of operation at Chicago, elected executive vice-president. Mr. Goodwin was chief mechanical officer from 1945 to 1948.

Maine Central

TROTT R. KING, road foreman of engines, retired.

WILLIAM E. MALOY appointed assistant road foreman of engines.

New York Central

ROBERT D. TIMPANY appointed acting assistant master mechanic at Dewitt, N.Y.

Northern Pacific

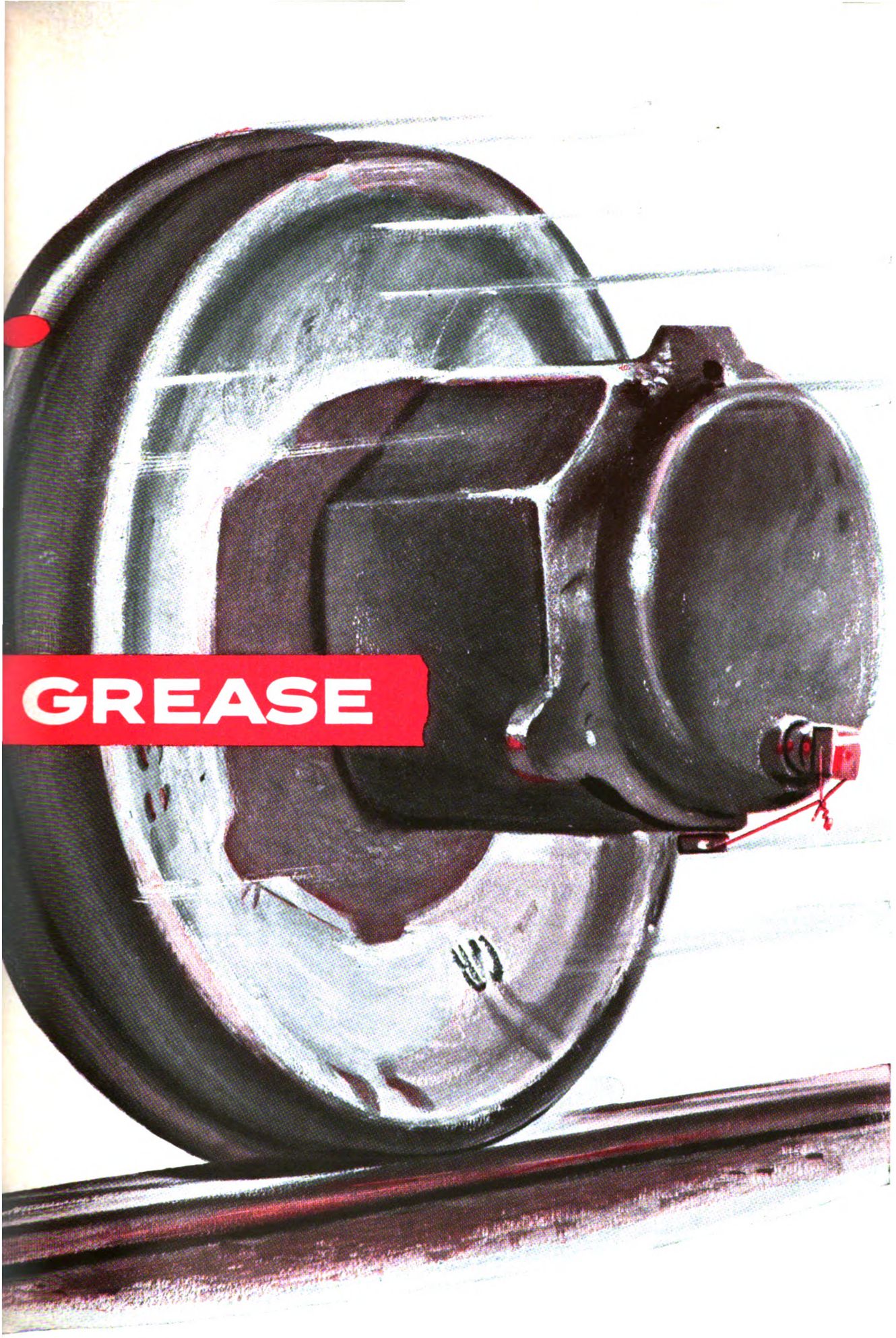
H. B. HOESLY, mechanical engineer at St. Paul, resigned.

E. C. ESTES, assistant to mechanical engineer, appointed mechanical engineer at St. Paul.

H. E. Brakke

H. E. BRAKKE, appointed superintendent of car department at St. Paul, Minn., as noted in the July issue. *Born:* Jackson, Minn., December 24, 1905. *Education:* Eastern State Teachers College; University of Minnesota College of Mechanical Engineering (B.M.E. 1931). *Career:* Served as laborer and machinist helper, on Chicago,

(*Continued on page 18*)


GREASE

PERSONAL MENTION

(Continued from page 14)

Milwaukee St. Paul & Pacific from 1923 until 1928; machinist helper on the Baltimore & Ohio until 1929, returning to CMStP&P in 1930 as a machinist helper. Became special apprentice on the NP at Brainerd, Minn., in 1931, subsequently serving as carman, draftman, assistant to general foreman, mechanical engineer, and assistant superintendent of car department.

St. Louis-San Francisco

O. H. SUMMERS, JR., appointed assistant electrical engineer of StLFS, not of N&W as mentioned in the August issue.

BLANKENBAKER, R. G. (not W. G.) appointed general foreman, car department, of StLSF at Tulsa, Okla., not of N&W as mentioned in the August issue.

Southern

RAYMOND D. GLENN appointed road foreman of engines. Headquarters, Birmingham, Ala.

Southern Pacific
San Francisco

B. M. BROWN, general superintendent motive power, has retired.

STANLEY M. HOUSTON, assistant general superintendent motive power, appointed general superintendent motive power.

Spokane, Portland & Seattle

DUNCAN J. RITCHIE, appointed general superintendent motive power of SP&S, at Vancouver, Wash., not of St-LSF as mentioned in the August issue. *Career:* Entered railroad service in 1904 as call boy on Great Northern. With Russian Railway Service Corps in Japan and Siberia from 1917 to 1919, returning to the GN in 1920 and becoming master mechanic at Willmar, Minn., in 1942. Became superintendent motive power of the SP&S in April 1955.

Union Pacific

J. J. CARROLL, general foreman at Omaha, Neb., appointed shop superintendent at Salt Lake City.

WILLIAM PARRY appointed engineer of locomotive construction and maintenance. Headquarters, Omaha, Neb. Formerly master mechanic of Western Pacific at Elke, Nev.

H. L. HOEFFEL, mechanical superintendent, transferred from Salt Lake City to Portland, Ore.

E. L. NEELEY, mechanical superintendent at Omaha, Neb., transferred to Salt Lake City.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE AUGUST ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	No. of units	Horsepower	Service	Builder
Canadian National	20[1]	1,200	Road switching	Canadian Locomotive
	32[1]	1,200	Switching	General Motors Diesel
	45[1]	1,750	Road	General Motors Diesel
	23[1]	1,600	Road	Montreal Locomotive
	50[1]	1,000	Road switching	Montreal Locomotive
	3[1]	1,000	Switching	Alco Products
Louisville & Nashville	10[2]	1,750	General purpose	Electro-Motive
	20[2]	1,600	General purpose	Alco Products
New York Central	16[3]	900	Yard switching	Electro-Motive
	45[3]	1,750	General purpose	Electro-Motive
Northern Pacific	1[4]	1,750	Road switching	Electro-Motive
	1[4]	1,200	Switching	Electro-Motive
Reading	6[5]	.....	General purpose	Fairbanks, Morse
Sacramento Northern	1[6]	600	.....	General Eletric
Virginian	6[7]	1,600	All purpose	Fairbanks, Morse
Western Maryland	2[8]	1,750	Road switching	Electro-Motive

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Atchison, Topeka & Santa Fe	1,000[9]	Gondolas	.....
	500[9]	Auto-box	.....
	300[9]	"DF" box	.....
	100[9]	95-ton ore	Company shops
	100[9]	Flat	Company shops
	50[9]	Air dump	Magor Car
Canadian National	1,000	50-ton box	Eastern Car
	500	50-ton box	Canadian Car & Fdry
	200	70-ton gondola	Canadian Car & Fdry
	250	50-ton box	National Steel Car
Canadian Pacific	200	70-ton gondola	Eastern Car
	40	70-ton covered hopper	Marine Industries
	200	70-ton hopper	National Steel Car
	500	50-ton box	National Steel Car
	200	70-ton flat	Canadian Car & Fdry
	500	50-ton box	Canadian Car & Fdry
Central of Georgia	500[10]	Box	Pullman-Standard
Chesapeake & Ohio	1,000[11]	70-ton hopper	Company shops
Chicago & North Western	1,575[12]	50-ton box	Pullman-Standard
	500[12]	Gondola	General American
Chicago Great Western	50[13]	70-ton covered hopper	ACF Industries
Chicago, Rock Island & Pacific	200[14]	50-ton box	ACF Industries
Fruit Growers Express Co.	400[15]	70-ton mechanical refrigerator	Company shops
Illinois Central	10[16]	70-ton covered hopper	General American
Kansas City Southern	75[17]	70-ton covered hopper	ACF Industries
Lehigh & New England	300	50-ton box	Pullman-Standard
Lehigh Valley	100[18]	Gondola	Bethlehem Steel
	100	50-ton box	ACF Industries
New York Central	3,000[19]	Box	Despatch Shops
Norfolk & Western	1,000[20]	70-ton hopper	ACF Industries
	500[20]	70-ton gondola	ACF Industries
Pennsylvania	1,200[21]	70-ton hopper	Bethlehem Steel
	800[21]	70-ton hopper	ACF Industries
	400[21]	70-ton hopper	Pullman-Standard
	1,000[21]	Box	Company shops
	500[21]	70-ton flat	Company shops
	100[21]	70-ton gondola	Company shops
Reading	700[22]	50-ton hopper	Bethlehem Steel
	150[22]	70-ton covered hopper	Bethlehem Steel
Rutland	100[23]	50-ton box	Pullman-Standard
St. Louis-San Francisco	1,350[24]	50-ton box	Pullman-Standard
	200[24]	70-ton covered hopper	Pullman-Standard
	200[24]	70-ton gondola	Pullman-Standard
St. Louis Southwestern	300[25]	50-ton box	Pullman-Standard
	100[25]	70-ton covered hopper	Pullman-Standard
	50[25]	Pulpwood rack	Company shops
Savannah & Atlanta	300[26]	Box	Pullman-Standard
Southern Pacific	2001[27]	Box	Pullman-Standard
	750[27]	Box	Company shops
Union Tank Car Co.	450[28]	10,000-gal tank	Company shops
	320[28]	11,000-gal tank	Company shops
	20[28]	8,000-gal tank	Company shops
Western Pacific	300[29]	50-ton box	Pullman-Standard
Virginian	500[30]	55-ton hopper	Company shops

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Canadian National	30[31]	50-ton refrigerator	Marine Industries
Chicago, Rock Island & Pacific	1[32]	RDC-1	Budd
Kansas City Southern	6[33]	Chair	ACF Industries

[1] Deliveries to be completed this year.
[2] Delivery of Electro-Motive units expected to begin around the first of next year; delivery of the Alco units, in October and November of this year.
[3] For delivery between October and December. Twenty-one of the 1,750-hp locomotives will be equipped with steam generators for possible use in passenger service.
[4] For assignment to the Camas Prairie. Estimated cost of 1,750-hp unit, $173,000; of the 1,200-hp unit, $110,000. Both units scheduled for December delivery.
[5] "Train Master" diesel unit. Cost $1,500,000.
[6] Unit delivered. Approximate cost, $85,000.
[7] Deliveries to begin this month.
[8] Approximate cost, $340,000. Delivery scheduled for this month.
[9] Purchases authorized by board of directors. Half the gondolas will be mill type with Nailable Steel flooring, and the other 500 will be the drop-bottom type. The automobile cars will have 15½-ft auxiliary doors and Nailable Steel flooring. One hundred of the "DF" cars will be insulated.
[10] Delivery of these 50-ft 9-ft-door cars expected in March 1956. Estimated cost, nearly $3.5 million.
[11] The cars—first big lot to be constructed new by the C&O in its company shops—will be built at an estimated rate of 10 a day, with the entire order scheduled for completion about the end of this year.
[12] Deliveries scheduled to begin in November.
[13] Estimated cost, $360,000. Delivery expected in January.
[14] Deliveries scheduled to begin in November.
[15] For delivery beginning in January 1956.

ORDERS AND INQUIRIES *(Continued from page 14)*

[16] Approximate unit cost, $12,100. Delivery expected this month.
[17] Estimated cost, $590,000.
[18] Building of gondolas to begin in November; of box cars, in January.
[19] Included in this order are 1,500 40½-ft cars with 8-ft doors, and 1,000 50½-ft cars, of which 500 will have to be 8-ft doors and the other half 15-ft doors. In addition, there will be 500 specially equipped 50½-ft damage-free cars, of which 200 will have 8-ft doors and 300 will have 15-ft doors. Deliveries are scheduled to begin in November and be completed next spring.
[20] Deliveries scheduled to begin early next year.
[21] The freight-car repair program of the Pennsylvania "has been materially accelerated." Cars are now being repaired at the rate of 175 cars a day.
[22] Approximate cost, $5,300,000.
[23] Approximate cost of these PS-1 box cars, $666,000. To be financed through a conditional sales contract. Deliveries scheduled for January.
[24] Purchase authorized by the Frisco's directors.
[25] The box cars, to cost an estimated $2,175,750, are scheduled for delivery through October; the covered hopper cars (estimated cost $877,800), are to be delivered in November; and the pulpwood cars (estimated cost $400,000), are expected to be delivered during November and December of this year.
[26] Delivery expected in March 1956. Estimated cost, $2 million.
[27] Cost, $8,250,000.
[28] Of the 10,000-gal cars, 250 are to be of aluminum. Deliveries scheduled for last quarter of 1955 and first quarter of 1956.
[29] To cost $2.5 million. Of the total group, 225 will be 50-ton 50-ft double door cars; 50 will be similar but equipped with automobile devices; and the remaining 25 will be equipped with fully adjustable damage-free loading equipment. Deliveries scheduled during September and October.
[30] Building of these cars to begin in second quarter of 1956.
[31] To be steel-sheathed overhead-iced express refrigerator cars. Delivery scheduled for completion this month.
[32] Delivered.
[33] Approximate cost, $850,000.

NOTES:

New York, New Haven & Hartford — The New Haven has announced its intention to purchase 10 1,200-hp. diesel-electric switching units for its New Haven-New York division.

Norfolk & Western — The N&W, is planning a new freight-car-building facility (see page 14), has estimated it will need 13,500 new 70-ton hopper cars and 1,100 new gondola cars in the next five years. During the same period, over 5,000 of the road's other freight cars will undergo heavy repairs.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of May 1955	Month of May 1954	5 months ended with May 1955	5 months ended with May 1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,475	5,785	24,869	32,362
3-06	Total, Diesel-electric	35,962	33,167	171,497	157,486
3-07	Total, electric	788	670	3,606	3,232
3-04	Total, locomotive-miles	42,453	39,750	201,012	193,529
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,732	1,549	7,986	7,359
4-06	Empty, total	936	905	4,463	4,316
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	13,446	12,165	57,644	62,907
6-02	Total in oil-burning steam locomotive trains	1,874	1,990	7,116	10,683
6-03	Total in Diesel-electric locomotive trains	103,852	93,696	482,411	434,226
6-04	Total in electric locomotive trains	2,468	2,101	11,012	9,926
6-06	Total in all trains	122,443	110,412	561,716	519,336
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.02	1.02	1.02
10-02	Loaded freight car-miles	43.9	41.8	42.6	40.7
10-03	Empty freight car-miles	23.7	24.4	23.8	23.9
10-04	Total freight car-miles (excluding caboose)	67.6	66.2	66.4	64.6
10-05	Gross ton-miles (excluding locomotive and tender) (000)	3,104	2,977	2,995	2,874
10-06	Net ton-miles (000)	1,415	1,318	1,344	1,265
12	Net ton-miles per loaded car-mile (M-211)	32.2	31.6	31.6	31.1
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.9	63.1	64.2	63.0
14	Averages per train hour (M-211):				
14-01	Train miles	18.8	19.1	18.9	18.9
14-02	Gross ton-miles (excluding locomotive and tender (000)	57,600	56,203	56,095	53,876
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	47.9	43.1	45.7	41.8
14-02	All	45.1	40.6	42.9	39.7
15	Average net ton-miles per freight car-day (000) (M-240)	944	809	869	776
17	Per cent of home cars of total freight cars on the line (M-240)	45.5	54.0	49.2	54.3

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,439	2,196	6,989	12,318
3-06	Diesel-electric	20,208	21,066	100,682	103,126
3-07	Electric	1,294	1,385	6,658	7,043
3-04	Total	22,942	24,647	114,331	122,487
4	Passenger-train car-miles:				
4-08	Total in all locomotive-propelled trains	231,972	244,128	1,153,948	1,220,245
4-09	Total in coal-burning steam locomotive trains	8,013	10,381	40,088	62,723
4-10	Total in oil-burning steam locomotive trains	4,609	8,639	17,996	40,115
4-11	Total in Diesel-electric locomotive trains	204,824	209,940	1,019,286	1,038,581
12	Total car-miles per train-miles	9.70	9.54	9.71	9.59

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	296,011	305,507	1,296,996	1,615,796
1-02	Steam, oil-burning	43,285	51,803	207,703	262,763
1-03	Diesel-electric[1]	3,606,244	3,268,292	17,265,779	16,202,520
1-06	Total	3,952,024	3,633,923	18,803,806	18,130,861
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	8,250	12,130	47,194	65,869
2-02	Steam, oil-burning	5,428	4,256	24,752	21,477
2-03	Diesel-electric[1]	243,889	254,473	1,214,878	1,270,516
2-06	Total	283,567	297,225	1,415,047	1,492,287
3	Hours per yard locomotive-day:				
3-01	Steam	5.6	4.5	5.0	4.7
3-02	Diesel-electric	15.4	14.7	15.3	15.0
3-05	Serviceable	15.2	14.1	15.0	14.3
3-06	All locomotives (serviceable, unserviceable and stored)	13.4	12.0	13.1	12.3
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.58	1.63	1.63	1.71
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.76	.75	.76	.76

[1]Excludes B and trailing A units.

SUPPLY TRADE NOTES

GOULD-NATIONAL BATTERIES, INC.—*Richard Relf* has been named district manager, Cleveland area.

■

GARLOCK PACKING COMPANY.—*Walter A. Reynolds* has been appointed district manager at Denver, succeeding *M. J. Lester*, retired.

■

BALDWIN-LIMA-HAMILTON CORPORATION.—*E. H. Schoonmaker* has been appointed eastern district sales manager, with headquarters at New York. *W. A. McKnight* succeeds Mr. Schoonmaker as manager of Baldwin's sales office at St. Louis. Mr. McKnight was formerly located at Houston, Tex.

■

ALAN WOOD STEEL COMPANY.—*Perry L. Francis*, formerly vice-president in charge of sales, has been elected vice-president in charge of marketing.

■

NEW YORK AIR BRAKE COMPANY.—Ground has been broken in Kalamazoo, Mich., for a new plant to supplement present manufacturing facilities. The plant will be known as the Kalamazoo Division.

■

BARBER-COLMAN COMPANY. — The new Barber-Colman Park Plant, which houses the Uni-Flo Air Distribution Division, has been opened at Rockford, Ill.

■

NATIONAL MOTOR BEARING COMPANY.—The *Robert Mitchell Company*, Montreal, will serve as Canadian distributors for National Motor Bearing Company. Under arrangements completed between the two companies, the Mitchell company will handle not only Canadian distribution of NMB sealed circulating oil lubricating systems, but will eventually manufacture, in Canada, some component parts.

■

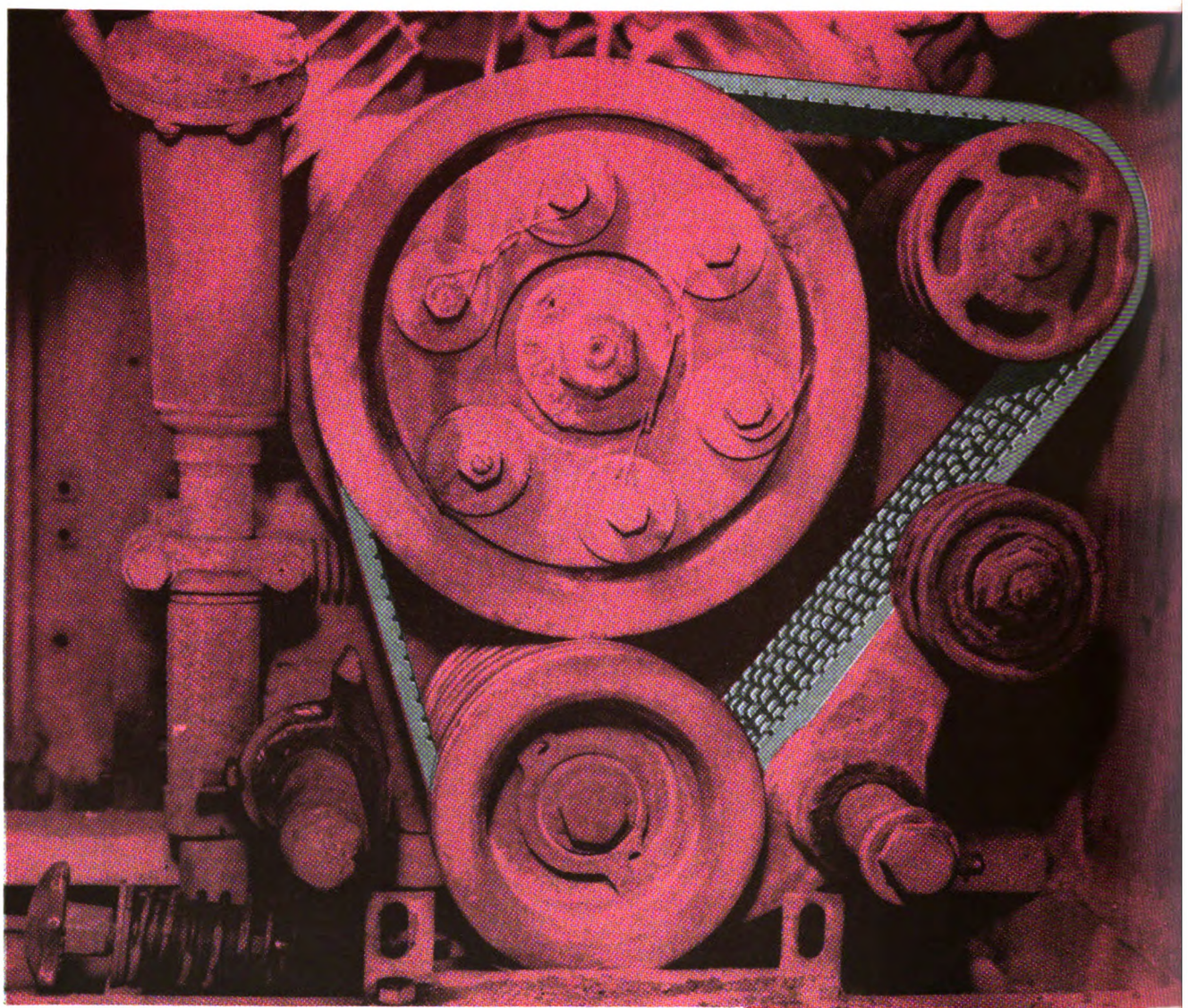
K. R. Ross

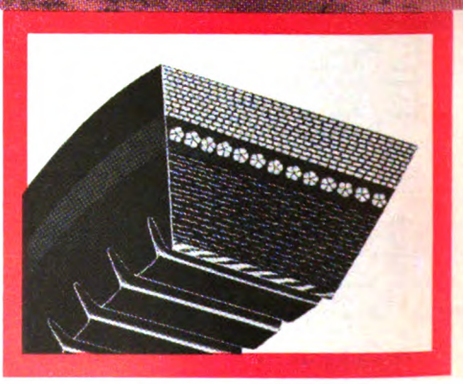
GENERAL ELECTRIC COMPANY.—*Kenneth R. Ross* has been appointed manager—transportation industries sales development, with headquarters at Schenectady, N.Y.

GE has opened an apparatus service shop

(Continued on page 22)

Dayton Cog-Belts* provide Service on Waukesha





Dayton Endless Cog-Belts, specially designed for the air conditioning unit shown here, are precision-made belts for precision-made equipment. They deliver 40% more H.P. because of their greater coefficient of friction. Maintaining positive speed, the Cogs give increased flexibility and resistance against squashing. The load-carrying section has minimum stretch because of a special cable twist synthetic cord. Requiring no lubrication or messy dressings of any kind, Dayton Endless Cog-Belts assure constant, dependable power at lower costs all year 'round.

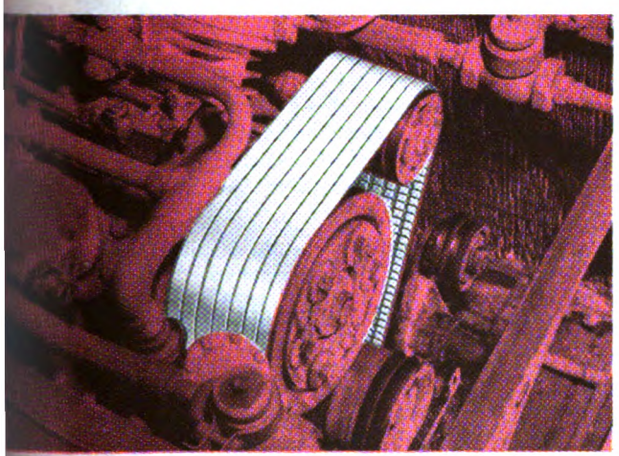
Multiple-Season Drives

Major Railroads use Dayton Cog-Belts for Waukesha Service

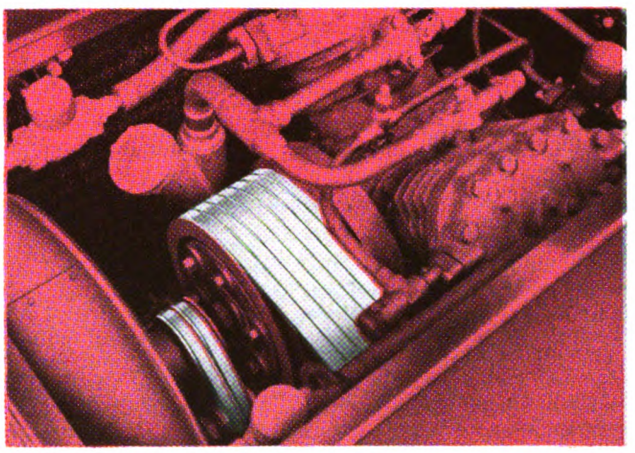
erving its customers twenty-four hours a day, many onths a year, Waukesha Air Conditioning keeps pas-ngers cool and comfortable on America's Railways. For nproved performance, rely on Dayton Endless Cog-Belts, he multi-season belts that deliver maximum power to Waukesha air conditioning units day in, day out, without nterruption.

Dayton Endless Cog-Belts were specially developed for he Waukesha ice engine air conditioning units by Dayton ield Engineers, working hand-in-hand with Railway lectrical engineers. Tests quickly proved these harder-ripping, longer-lasting Dayton Endless Cog-Belts were the perfect answer to multi-season service, constant assured power, low-cost continuous performance. As a result, major railroads specify Dayton Endless Cog-Belts for their Waukesha equipment to get uninterrupted passenger air conditioned comfort at lower V-drive maintenance and replacement costs.

Investigate Dayton Endless Cog-Belts for your Waukesha V-drives. If you want these advantages, please consult with Dayton Railway Engineers. They'll be glad to help you solve your V-drive problems and improve present drive performance. Dayton Rubber Co., Railway Div., Dept. 206, Dayton 1, Ohio



With twenty-two years of specialized railway experience, it was easy for Dayton to develop the right V-Belts for this unit. Dayton Endless Cog-Belts provided the extra power, stamina and endurance that led to savings in time, labor and replacement costs.



Ten Dayton Endless Cog-Belts supply all the needed power on this Waukesha air conditioning unit. By employing seven Daytons on the compressor drive, two on the condenser drive and one on the fan belt drive, longer-lasting, low-cost service is assured.

GOLDEN JUBILEE

Dayton Rubber 50 YEARS OF PROGRESS

© D.R. 1955 *T.M.

World's Largest Manufacturer of V-Belts

Specialized Railway Representatives in New York, Chicago, Dayton, St. Louis, Atlanta, and San Francisco

SUPPLY TRADE NOTES *(Continued from page 19)*

at 2809 North Robertson street, New Orleans, La. *E. A. Woniger*, Atlanta service shop specialist, operates the new facility. Another apparatus service shop is being constructed in North Bergen, N.J.

■

ALUMINUM COMPANY OF AMERICA.—*Lewis P. Favorite* has been appointed manager of product sales, and *W. S. McChesney* manager of industry sales. Both are located at Pittsburgh. Mr. Favorite was formerly manager of the district sales office in New York.

■

SCULLIN STEEL COMPANY.—*Paul F. Gutmann, Jr.*, formerly assistant chief mechanical engineer, has been appointed chief mechanical engineer.

■

UNITED STATES RUBBER COMPANY.—*G. Allen Lovell* has been elected a vice-president and appointed general manager of the company's mechanical goods division. Mr. Lovell has been assistant general manager of the division.

■

PENNSYLVANIA SALT MANUFACTURING COMPANY.—Executive and operating division offices have been moved from the Widener building to Three Penn Center Plaza, Philadelphia.

■

RIDGE TOOL COMPANY.—*D. H. Rowe* has been appointed assistant sales manager.

■

GUSTIN-BACON MANUFACTURING COMPANY.—*Herb J. Smith*, formerly Kansas City district sales manager, has been appointed manager of the Railroad Sales Department, succeeding *George M. Seymour*, resigned. Mr. Smith will be located at 210 West 10th street, Kansas City.

■

E. W. Kettering

GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—*E. W. Kettering* has been appointed to the new position of director of research. *B. B. Brownell*, assistant chief engineer, has been advanced to chief engineer.

■

W. H. MINER, INC.—*Edward H. Lehman* has been appointed to the newly created position of vice-president—mechanical; *Vernon S. Danielson*, chief draftsman, promoted to assistant to vice-president—mechanical, and *William D. Wallace*, mechanical engineer, appointed assistant to vice-president—engineering.

■

METAL & THERMIT CORPORATION.—A combined general office, research and distribution center, representing an investment of over $2,000,000, is expected to be completed in Rahway, N.J., in April 1956.

■

MILLER LUBRICATOR COMPANY.—*Willian G. Gray* has been appointed vice-president in charge of railway sales, with headquarters at 80 East Jackson boulevard, Chicago. Mr. Gray was previously manager of railroad sales for the Pyle National Company.

■

T-Z RAILWAY EQUIPMENT COMPANY.—*John Van Nort* has been appointed representative on the West Coast.

■

NATIONAL MALLEABLE & STEEL CASTINGS CO.—*Raymond E. Valentine*, sales manager, Railway division, at St. Louis, has been named assistant vice-president, sales, of the division, at Cleveland.

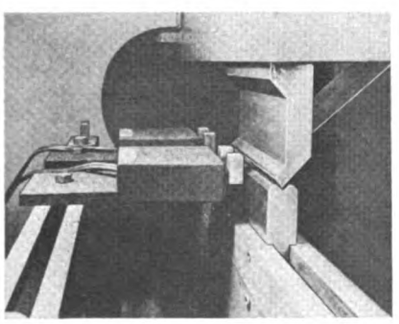
■

WHEELABRATOR CORPORATION.—*American Wheelabrator & Equipment Corp.* has changed its name to the Wheelabrator Corporation. The company's district sales office in Detroit has been moved to 13504 Fenkell avenue.

EQUIPMENT... *New Ideas—New Uses*

(Continued from page 10)

are inserted at both sides between the bottom control members and the column faces and are driven "home." The bolster is then lowered and positioned on the package. This ride stabilizer is available as a complete unit, or the component parts can be supplied. *The Holland Company, 332 S. Michigan avenue, Chicago.*



Magnetic Back Gauge

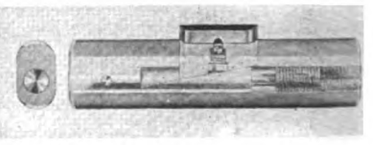
The AAC magnetic back gage it an attachment for press brakes, rolls and other metal forming machines. It is designed to correctly position work at all times. By doing this it is claimed that production is increased, mistakes and spoilage eliminated, and the danger of hand and finger injuries removed. Material fed to a machine with this gage is pulled into the proper position and held there while the ram is in motion, enabling the operator to keep his hands clear of the work. The operator does not have to feel to determine if the sheet is against the back stop.

The magnetic holding feature is energized only until the ram engages the metal. It then is released to allow full bending action during the forming operation. Accessory devices have been designed for specialized and automatic applications. *American Actuator Corporation, 219 East 44th street, New York 17.*

Portable Re-Fueler

The Briggs portable refueler is a two-wheel, lightweight unit that wheels freely over unpaved surfaces because of its wide surfaced wheels. Its 10 gpm self-priming hand pump is designed for one-man operation. The unit is intended to fuel equipment at the work site, avoiding long trips to distant fueling points. It can be used on a fuel truck or on the ground.

Th fuel drum arm is insered in an oil drum and takes its fuel well above the water and sludge level of the drum. The intake pipe is screened to prevent the entry of large particles. The oil is then passed through a full-flow filter which uses a disc-pac filter cartridge. *Briggs Filtration Company, River road, Washington 16, D. C.*



Adjustable Draw Key

With one easy wrench adjustment, Morse-taper tool shanks can be positively locked in machine spindles using the Davis adjustable draw key. All working parts of this draw key are precision-machined from tool steel. There are only three moving parts—the expanding wedge, plunger, and

(Continued on page 112)

EDITORIALS

Ton-Miles vs. Maintenance

The maintenance department says "Be kind to our locomotives. Don't overload them—don't run them too fast, and let us see them more often." To this, the operating department says, "This is a tonnage road. Revenue is by the ton-mile, and who do you think pays your salary anyway."

The operating department has a good point there, and in most cases, it would be hard to prove that some added revenue did not pay good dividends on a little added maintenance. And it is an easy temptation and a great convenience if one can take a little more out of the motive power and thereby clean up a traffic situation. Horsepower ratings have been going up and for good reason.

On the other hand, there is always the probability that the operators could cooperate a little more with the mechanical department. It is indicated poignantly in the recommendation of builders to foreign operators.

In a number of foreign countries diesel locomotives are purchased without the accompaniment of sufficient spare parts and without adequate shop facilities. Many relatively new locomotives stand on the shop tracks where they are cannibalized for parts. To take care of this situation, the manufacturers recommend that the users derate their locomotives 35 to 50 horsepower. The result is that failures almost disappear and maintenance requirements decline to such a degree that the railroads are able to carry on without great difficulty. The situation shows that maintenance increases sharply under high load.

This practice is scarcely something that could be recommended for American roads, but it does indicate that much could be saved by avoiding unnecessary overloads or even top loads when operating conditions permit.

Fix It or Describe It

The fact that there are today many millions of motorists who drive cars without the faintest idea of what goes on under the hood is sometimes used to question why a locomotive engineman should have to play the dual role of both driver and mechanic when something goes wrong.

Just how accurate is the parallel? And how similar are the effects of a failure?

Few bus, and not too many truck, drivers are able to fix their vehicles if they break down on the road. The results of the failure are, however, quite different from the results of a locomotive failure. To begin with there are many highway service stations and in most areas there will be one close enough to perform at least emergency repairs. Second, if a truck, bus or automobile breaks down on the highway, it does not tie up other traffic like a train stalled due to locomotive failure.

This is the case for the side that contends that the enginemen should be taught the fundamentals of trouble shooting so that he can cope with failures that arise. The other side of the argument is that you might be able to train an engineman better in the handling of his unit if you could devote all time available for instruction to teaching him the operation of the locomotive so that he can do a better job of train handling.

Those who doubt the wisdom of attempting to make a mechanic out of a locomotive engineman wonder just how good a mechanic you can make in the limited time available for training in both operation and trouble shooting. Some roads feel that only a minimum of such training is now needed since the advent of train radio. They feel that the primary emphasis should be on teaching the engineman to describe his failure correctly so that a diesel maintenance man at the nearest terminal can diagnose the trouble and prescribe the remedy. It cannot be denied that such a man has a far better background and knowledge for figuring out what to do than most enginemen could possibly acquire.

Letters To the Editor

Why Use Inadequate Couplers?

TO THE EDITOR:

It is now three years since the new Type F coupler received AAR approval for unlimited application to freight cars. I have no personal interest in this coupler, but as former chairman of the AAR Committee on Couplers and Draft Gears it seems to me unfortunate that so many railroads are continuing to build new freight cars equipped with the old and now obsolete Type E coupler.

The Type F coupler was designed and produced under the direction of the Mechanical Committee of the Standard Coupler Manufacturers in response to a demand from the Coupler and Draft Gear Committee, acting on behalf of the railroads, for a coupler that would fully meet the much more severe requirements of present day freight service. Exhaustive tests, both laboratory and service, have shown that the manufacturers completely succeeded in carrying out their assignment.

This Type F coupler has all the advantages of both the Type E rigid shank and the alternate standard swivel shank couplers, and none of the disadvantages of either. It has greatly increased strength and eliminates more than half of the present free slack, leaving only 3/8 in. of slack per pair of couplers.

Also incorporated are practically all of the outstanding features of the latest Type H tightlock coupler for passenger service, namely, complete vertical interlocking of mated coupler heads which serves to keep cars in alignment and resist jackknifing and overturning in derailments, longer life due to restriction of vertical movement between mated couplers and elimination of vertical slipovers.

Unlike the Type E, the Type F cannot be opened by bouncing of cars, and the dangerous cross-key is eliminated entirely. The strength of the Type F coupler shank

THE VIRGINIAN

Replaces freight steam power with Fairbanks-Morse Power

Train Master performance on demonstration was the start of the Virginian's program to replace steam power with diesel-electrics. With a large initial order—and large re-order—all in the short space of 13 months, they have put under dieselization all freight service formerly handled by steam power—all with Fairbanks-Morse Motive Power.

Here on the Virginian, the Opposed Piston Diesel engine and Fairbanks-Morse locomotive design have again proved . . .

Your Best Motive Power Investment is in Fairbanks-Morse Locomotives

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL LOCOMOTIVES AND ENGINES • RAIL CARS AND RAILROAD EQUIPMENT • ELECTRICAL MACHINERY • PUMPS • SCALES • WATER SERVICE EQUIPMENT • MAGNETOS

is more than 70% greater even than that of the Type H tightlock coupler, the cost of which is much greater.

One additional important feature is possessed by the Type F coupler only. It is not often that an improved device is offered which automatically extends the advantage of this improvement to all older devices with which it may be associated, but we find this in the Type F coupler. In the event of a pull-out, the Type F coupler will support the mate coupler and prevent it from falling to the track, no matter whether it be another Type F coupler or an older type coupler not provided with this protection. This feature will undoubtedly prevent many derailments.

ICC Accident Bulletin No. 122, covering the year 1953, the latest available, shows that broken wheels of all kinds caused a total of 266 derailments in that year, whereas coupler and draft rigging failures caused a total of 332 derailments in the same period. Of the latter failures it is estimated that at least 193 would have been prevented by the use of Type F couplers.

The railroads have spent several hundred millions of dollars for diesel locomotives in the past few years, but it takes more than diesels to run a railroad. Why should any railroad in this day and age build new freight cars and equip them with couplers designed for conditions that existed 25 years ago? This appears especially shortsighted in view of the fact that if the car when built is not designed for application of the improved Type F coupler such application will cost a great deal more if made later, and this will almost certainly be required by the AAR within a comparatively few years.

H. W. FAUS,
Engineer Locomotive Equipment (Retired)
New York Central System

An Attack on Tank-Car Hot Boxes

TO THE EDITOR:

Intensive railroad efforts to combat hot boxes are quite effective in some specific instances, but in general, the results are spotty. For example, based on miles per hot-box-car set off between division terminals, as reported by the AAR, the record of 363,197 miles for March, 1955, was not as good as in March, 1954, but better than in March, 1953. The comparison was just the reverse for the month of February in the last three years. On the other hand, the record of 601,256 miles for January, 1955, much better than for the same month in either of the two previous years.

Hot box mileage also varies with the type of equipment or service, being only about one-third as much for tank cars as for other interchange freight cars. To meet the serious situation caused by recurring hot boxes on private tank car equipment, the west coast districts held a number of meetings earlier this year at which representative tank-car owners and railway operating and maintenance men discussed causes and effects and decided on remedial action which has already tended to reduce train delays, repair costs and derailment hazards.

Contributing defects cited as most often responsible for hot boxes include: binding center plates, improper side-bearing clearance, worn brasses, defective dust guards, journal bearings, wedges and packing retainers. Most of these defects center in the trucks which, by and large, are not up to modern standards especially in tank cars. In fact, it is reported that only eight per cent of the tank cars in service are equipped with long-travel springs and snubbers, the balance having old-style trucks with short stiff springs and no snubbing devices.

Obviously, there is far too-prevalent thought that any old kind of truck is good enough for a tank car, and perhaps it is true that tank car shipments are less easily damaged by rough riding trucks than average merchandise loaded in box cars. But what about the effect in promoting hot boxes and increasing car maintenance cost? It can hardly be questioned that the installation of modern easy-riding trucks in tank cars as fast as practicable is a good investment for the private car owner as well as a help to railroads which operate the cars and shippers who use them.

Besides the installation of new trucks, and important point of attack is in better maintenance of existing trucks on tank cars now in service. It was repeatedly brought out at the meetings mentioned that some private tank car owners take cars into their own shops and do a beautiful job of repairing, painting and stenciling everything down to the trucks, but peprmit trucks to go out of shop "as is", if there is any service metal left in wheels and other wearing parts above the actual condemning limits.

Another bad practice frequently encountered, apparently, is failure of tank car owners to authorize necessary and badly-needed truck repairs when tank cars are at railroad shops or repair tracks for other work. Nor are the railroads blameless, as repair track forces frequently allow "in date" journal boxes to pass through without attention on the theory that whatever is necessary will be done at the next classification yard. As a result, these particular boxes get no attention at all and are potential sources of hot box trouble.

The solution to these difficulties seems obvious and needs little elaboration. Modern equipment, materials and practices will help, but are useless without due attention to human factors by adequate training and supervision.

GEORGE BOSTWICK

NEW BOOKS

MECHANICS OF MATERIALS. By Philip G. Laurson and William J. Cox. Published early this year the volume offers an excellent presentation of the principles underlying machine and structural design, as well as its correlation of theory and practice.

The new edition gives increased emphasis to the determination of stresses by the methods of statics and the use of free-body diagrams. Largely rewritten, the chapter dealing with mechanical properties of materials has been further clarified and brought up to date. Other changes include the revision of tables of structural shapes to conform to present standards, while widely used specifications serve as the basis for allowable stresses.

Mr Laurson is associate professor emeritus of civil engineering, Yale University School of Engineering.

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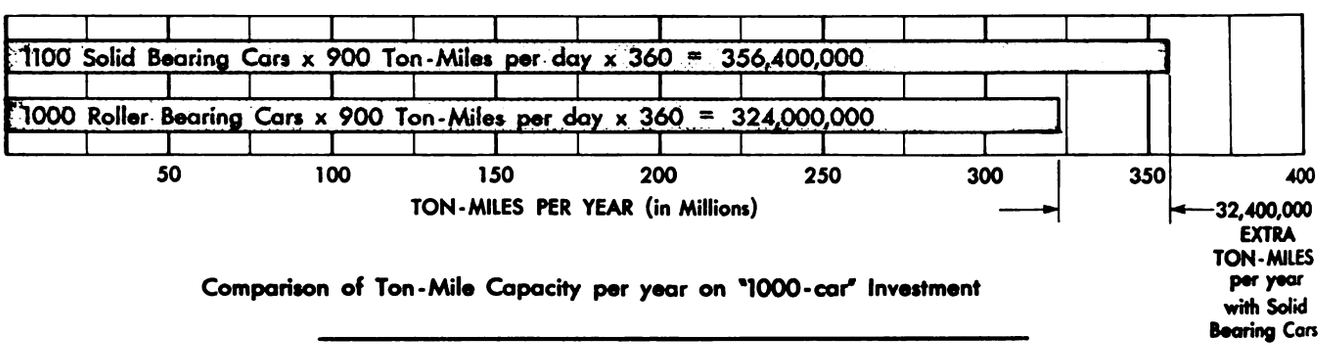

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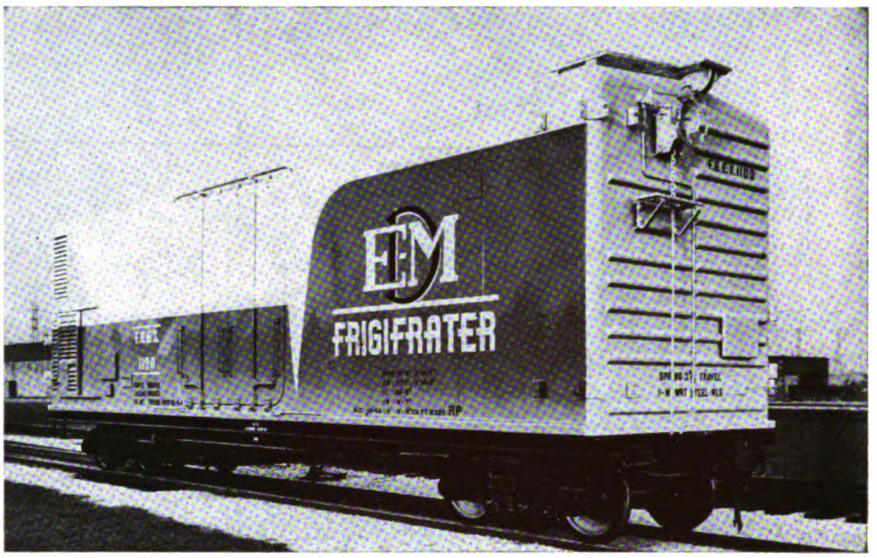
EMD Reefer Designed for Minimum Maintenance



The Electro-Motive design of mechanical refrigerator car about to go into production differs from conventional construction in several important ways. Among the basic departures are:

1—A different type underframe construction and the car body mounting.

2—A novel method of opening the doors, making the 8-ft door practical for reefer service.

3—The way the insulation contributes to the structural strength of the body.

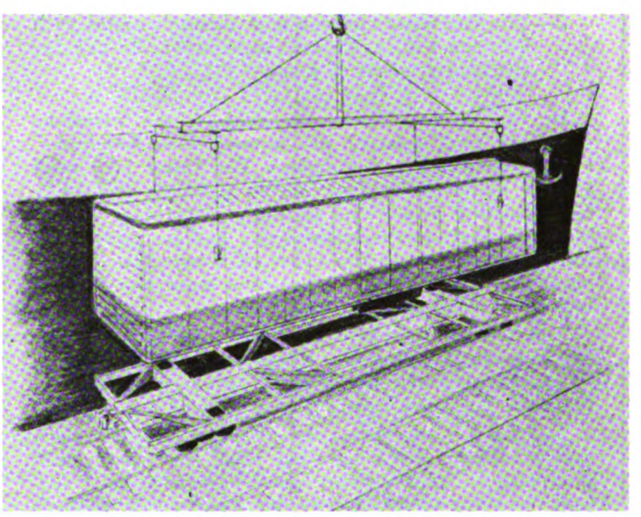
4—That all through metal paths to the refrigerated space are blocked.

5—An induction-type generator, eliminating slip rings, brushes and voltage regulator.

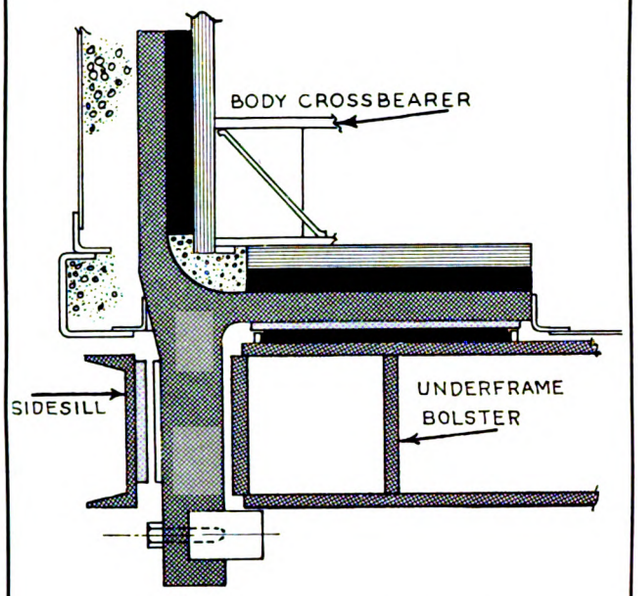
The carbody of the "Frigifrater" as the new car is named by EMD, is completely separated from the steel underframe. Fiber supports and cushioning devices permit the carbody to slide freely over the underframe, within practical limits, thus protecting the carbody, refrigeration equipment and lading from damage of impact inertia caused by slack action of the train or switching operations.

The underframe is reduced in function to that of a buff and drag structure only. It is essentially a flat car with four pads on which the body rests. Bending action under buff load has been practically eliminated. The car will stand 800,000-lb. buff load, the same as passenger cars and twice the design figure for freight cars. The underframe has no camber. The buff load goes straight through approximately on the neutral axis, causing only compression and no bending.

Because the carbody is supported by the underframe at two places on each bolster, the weight is transmitted directly through the bolsters to the trucks. It does not go through the side sills, end sills, or the center sill. Cushioning of the body and its load against impacts is done in two ways. The first is a conventional rubber draft gear. Second is a body movement of 2 in. in either direction on the underframe. The cushioning medium for this movement is also rubber. The two major moving parts of this cushioning device are mounted to the body and to the underframe under the center of the doors.



The body can be lifted free of the underframe by engaging four lifting pads mounted between the inner and the outer box.



Two important features of the Frigifrater are shown by this sketch:

1—The sliding connection between the car body and the underframe.

2—The complete absence of a through metal path between the inside and outside of the car for the transmission of heat.

In the above sketch, the underframe members (side sill and bolster) are shown cross hatched—as is the odd-shaped member. The latter is a steel casting about 8 in. long which prevents the body from twisting or skewing on the underframe. It also locks the body to the underframe and prevents separation of the two in the event of a wreck or derailment. Two bolts and lockwashers near the bottom lock each casting to the underframe.

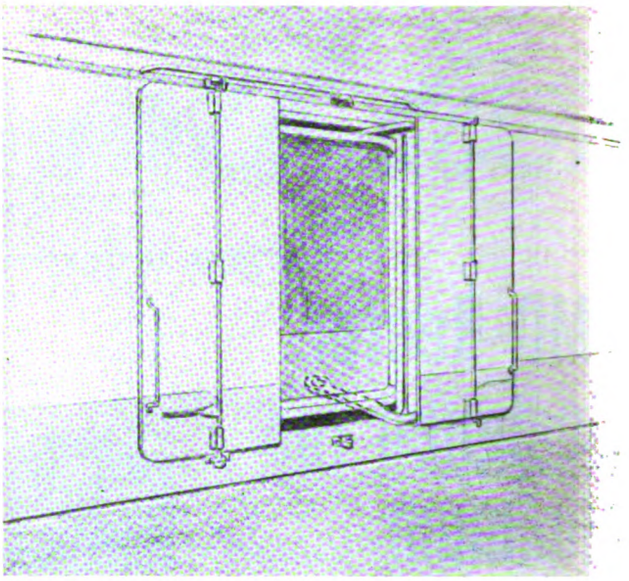
The shaded members are wear plates. The horizontal plate is the one on which the body slides relative to the underframe (a 2-in. movement either way from the designed location, or a total of 4 in.).

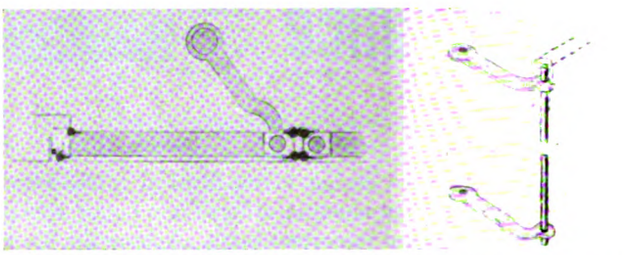
The solid black pieces are phenolic laminate thermal breakers. These are what break up what would otherwise be a continuous metal path for heat transfer. The same material is used to form heavy washers and bushings for all bolts that extend through to the inside of the car body.

To the top and right of these thermal barriers are two steel plates (shown striped) which are welded to the car body. A short portion of what EMD terms the body cross bearer is shown attached to the two steel plates (which are bolted to the steel casting through the phenolic pads).

Thus the body and the steel casting slide longitudinally as a unit on the underframe. At the same time the lower part of the vertical flange because of its close clearance on either side to the underframe cross bearer and to the side sill prevents sideways movement between the body and the underframe.

Removing the bolt and lock washer near the bottom of the steel casting breaks the only direct connection between the body and the underframe. The body can then be lifted free by crane (the fuel lines must also be disconnected) and placed on shipboard or any place else desired. The cooling unit can be operated with the body separated either by supplying fuel to the diesel engine or 220-volt a-c to the refrigerating unit.



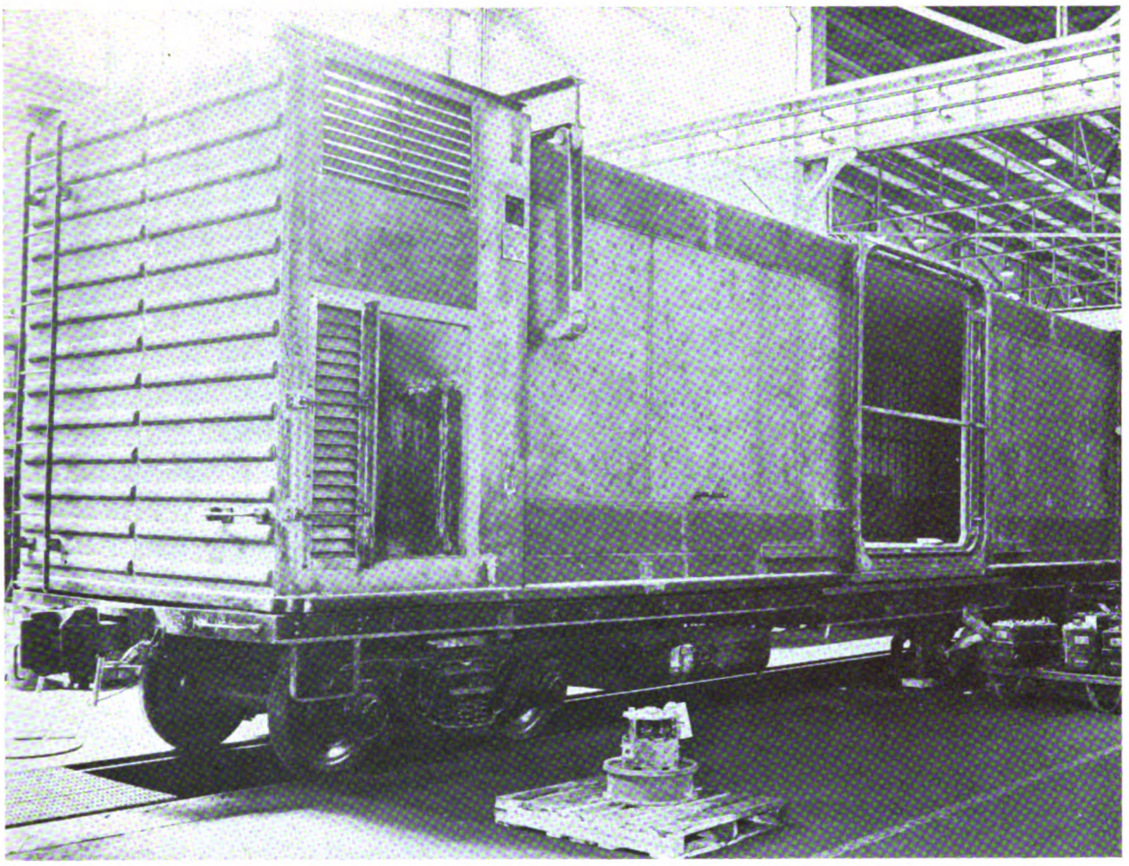


Each door is mounted to a pivoted arm top and bottom. In opening it swings out a maximum of 13 inches. With one door open, the clear opening is 4 ft—with both doors, 8 ft. Vertical clearance above a 48-in. platform is 80 in.

Cold Wall Construction

The carbody is made entirely of steel except for the replaceable plywood lining on the inner side walls. It has an inner and an outer box with the space between the two containing the insulation and the ducts for the passage of the coolant air. The inner box is the strength member; the outer is essentially a tent. The type of insulation used does cause the "sandwich" made by the insulation and the two walls to contribute to the structural strength of the body. This additional strength was not included when designing the body structure. The insulation used is a plastic foam which fills up ths space between the inner and outer steel walls and forms a solid structural member much like that produced when metal is bonded to plywood. This material fills every void. It does not pack down even under great pressure, and does not absorb moisture thus preventing corrosion of hidden steel surfaces.

The all-steel all-welded cold wall lining of the car is surrounded by air ducts fed with captive refrigerated air circulated by blowers. In this manner the heat is blocked on its way into the car instead of being removed after it has entered. The lading is kept moist as well as cold. The refrigerated air that goes over the evaporator (and is partially dehumidified there) does not come into contact with the lading. The captive refrigerated air surrounding the lading compartment is dry and cold, keeping the carbody free from moisture and corrosion. This cuts the need for defrosting to once in seven days (controlled by



The Frigifrater body is built in four basic steps:

1—The bottom pans (the bottom structural member to which the floor is applied) are built and insulated with 6-in. reflective aluminum.
2—The sides and ends are joined together uninsulated. This shell is then attached to the bottom pans.
3—The carbody (minus the roof) has the walls and ends insulated by pouring foam from the top down into spaces between walls.
4—The completed roof assembly, including insulation, is lowered on the body and welded in place.
The refrigerated box, or car body, can be lifted clear of the underframe. The cooling unit can be operated by supplying either 220-volt a-c or diesel fuel.

automatic timer). The only moisture that need be removed is that which may leak in around the gaskets and through the 1¼-in. drain pipe when the moisture is not frozen.

No Metal Heat Paths

The all-metal carbody is so constructed that there is no through metal conduction of heat between the inner shell and outer shell. All inside and outside walls of the carbody are welded to form a vapor tight container. The steel corrugated inside wall is lined with replaceable ½-in. plywood panels to furnish a smooth surface.

The double doors provide a full 8-ft opening to the loading compartment. A novel hinge arrangement enables either or both doors to be opened as required. The doors come out about 15⅝ in. and pivot back to minimize the clearance required at loading docks. Fork lift trucks can go in and out of the car without difficulty. Double seals, round corners and glass polyester resin inner panels all reduce heat leakage to a minimum.

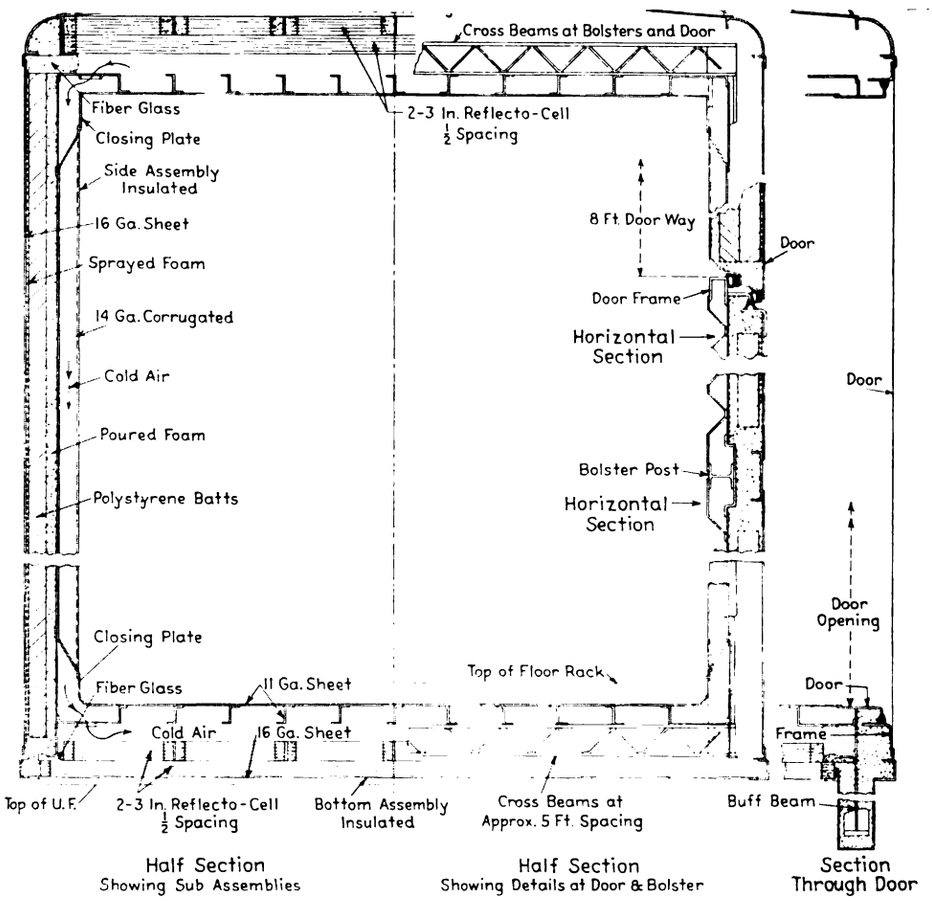
Three Types of Insulation

In the present car, the vertical walls are filled with either a foamed-in-place material and polystyrene batts. Two 2-in. insulating batts are bonded to the inner surface of the outer wall by spraying the mating surfaces with the foamed-in-place insulation. The remainder of the 6-in. space is filled with the poured insulation. If production and price become more favorable, the entire void will be filled with the poured insulation. The floor and ceiling are insulated with a "reflective" insulation consisting of sheets of aluminum separated by spacers, which combine the reflective quality of aluminum and the thermal resistance of the dead-air spaces. All of the insulation is moisture proof, non-deteriorating and vermin resistant.

The insulation which is poured in place in the walls and ends is composed of two principal ingredients which are pumped and metered through a pipe into the cavity between the inner and outer boxes. The two ingredients are mixed in a nozzle at the end of a pipe. The chemical reaction causes the mixture of the two ingredients to foam.

The resultant foam has a consistency approximating that of rye bread. All voids are filled because it is applied as a liquid. It does not settle and has a density from 1.5 to 2 lb per cu ft. Its density can be made up to 40 lb per cu ft. At the lower density, however, insulation value is at an economic maximum and the "sandwich" formed by the two steel plates and the insulation is strong enough that 16-gage steel is suitable for the side sheets.

Jacking is done on the underframe opposite the front and rear bolsters. There are also four lifting pads on



Specifications of the Frigifrater

Length over buffer blocks, ft	52
Distance between bolster centers, ft	39
Distsance—buffer block to bolster center, ft-in.	6—6
Height over running board, ft-in	14—11-3/4
Top of center sill to top of rail, ft-in.	3—5-7/16
Width:	
Over side sheets, ft-in.	10—1
Over side ladders (max. width), ft-in.	10—7-3/4
Over grab irons on doors (max. width), ft-in.	10—7-3/4
Over door locks, ft-in.	10—7-5/8
Total inside height, ft-in.	8—10-3/16
Effective inside height (top of floor rack to bottom of fan guard), ft-in.	8—0-13/16
Inside width (inside plywood panels), ft-in.	8—5-11/16
Inside length, ft-in.	44—0-7/8
Total volume, cu. ft	3305
Effective lading volume, cu. ft	3013
Height of door opening, ft-in.	7—11
Width of door openings, ft-in.	8—0
Journal size, in.	6 x 11
Weights:	
Gross weight (fully loaded), lb	210,000
Capacity, lb	127,000
Load limit, lb	127,800
Light weight (dry), lb	82,200
Axle loading (max.), lb	52,500
Operating supplies—fuel oil, gal	400

*Estimated

the car sides reached through cover plates that allow the entire carbody to be lifted from the underframe. Other underframe and body equipment (brakes, type E coupler, rubber draft gear, uncoupling device, ride control trucks, roller bearings, etc.) are standard items.

Both Cools and Heats

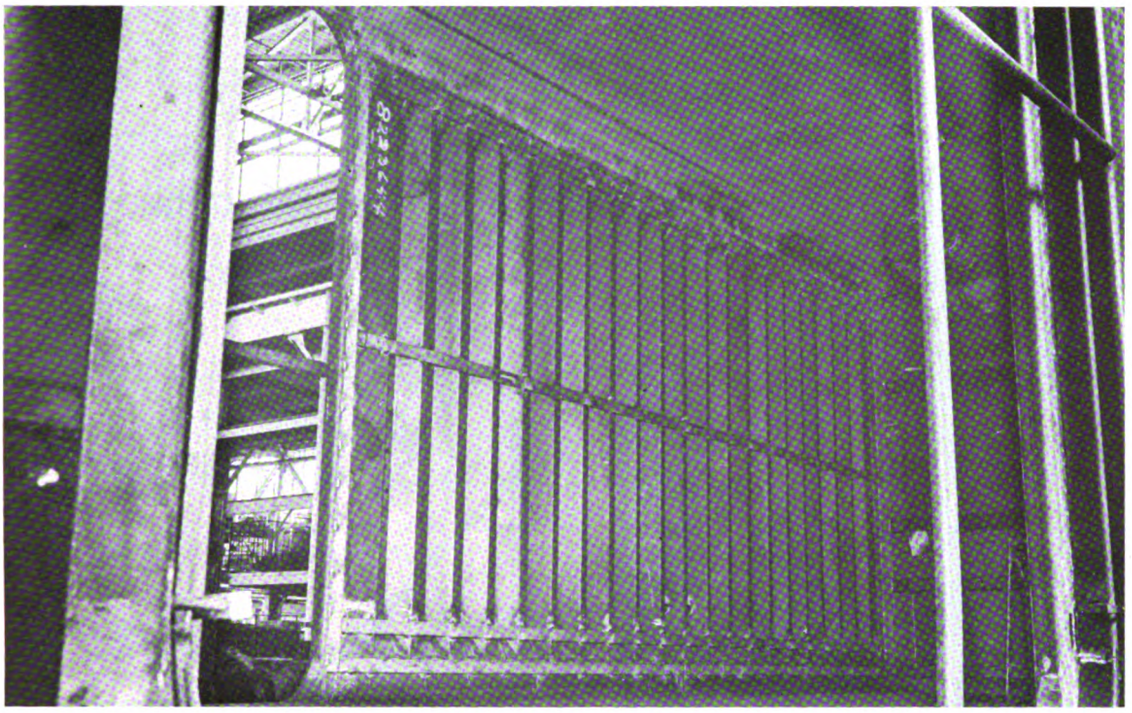
The cooling equipment is the standard Frigidaire railroad refrigeration unit with a couple of modifications. Both heating and cooling are provided. Heaters are incorporated in the evaporator area for both automatic defrosting and to heat the car when the outdoor temperature falls below the thermostat setting.

The automatic switch-over from cooling to heating works only when the car is set to maintain a temperature more than 20 deg. above zero. For commodities that are carried at temperatures lower than 20 above, no heat is needed because the colder they are kept the better.

The power plant is driven by a GM model 2-71 36-hp diesel engine driving a 17.5-kw alternator. The refrigeration equipment consists of a dual 5 hp compressor-condensor unit and a matched evaporator.

Unique Generator

An induction generator, the reverse of the common squirrel cage induction motor, is used in the refrigerating unit—the first time an induction generator has been used in any industry. With this induction alternator there are no slip rings, no brushes, no exciter and no voltage regulator. The only wearing parts are the sealed shaft bearings. Correction of the power factor is done by a group of capacitors.



The space between the inner and outer box is virtually a continuous duct for blowing the cooling air in its closed path. The air in the revenue space (i.e. that surrounding the lading) is circulated when necessary by three fans. These are mounted in the ceiling along with lights that can be furnished to eliminate the need for extension cords.

Induction motors are used throughout—the two 5-hp compressor motors, the two 1-hp blower motors that drive four blowers to circulate 5,000 cfm of coolant air in its closed path, and the three $\frac{1}{6}$-hp motors that drive the fans in the roof of the lading compartment.

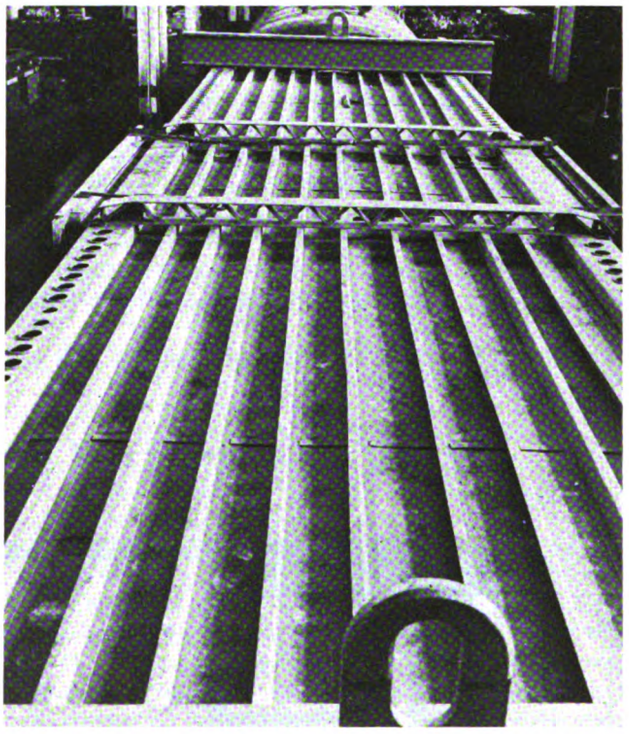
These three roof blowers are used to remove the heat from a hot load. When the car is in frozen food service their use is not required. In handling fresh produce, the fans are left on because the circulation aids in removing the heat generated by ripening.

The engine runs at three different speeds. Idling speed is 1,000 rpm, the normal operating speed 1,200 rpm. It is speeded up automatically to 1,400 rpm when the compressor cuts in. The engine normally runs continually, with temperature control attained by cutting loading and unloading the compressor. When the engine is shut down and has to be started, a hydraulic starter is included with both automatic and manual charging features. The latter is simply a hand-operated pump.

Capacity of the refrigerating unit varies from 2 to 9 tons. It is 2 tons when the box is near its minimum temperature setting of about 20 below zero—9 tons when box is hot and heat and transfer is at a maximum.

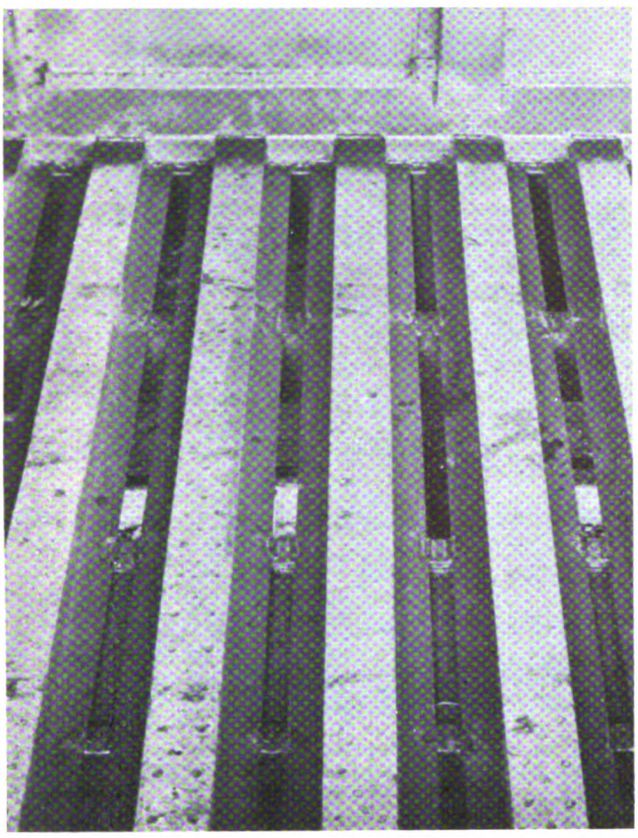
The cold wall principal is employed for several reasons: (1) Defrosting is required much less often and therefore less unnecessary heat is added which would require later removal; (2) less chance for the load to be dehydrated because the air around it never gets to the evaporator; (3) there is therefore less frost formed on the evaporator to reduce its efficiency of heat transfer; (4) with the large cooling surface of the walls, ends, ceiling and floor temperature differential can be small, and (5) the cold wall removes heat on the way into the car which EMD thinks is the place to do it.

All exposed steel within the car is covered with sprayed-on Neoprene or Epon enamel. This protects against all forms of corrosion and also permits the use of sulphur dioxide inside the carbody for ripening control.

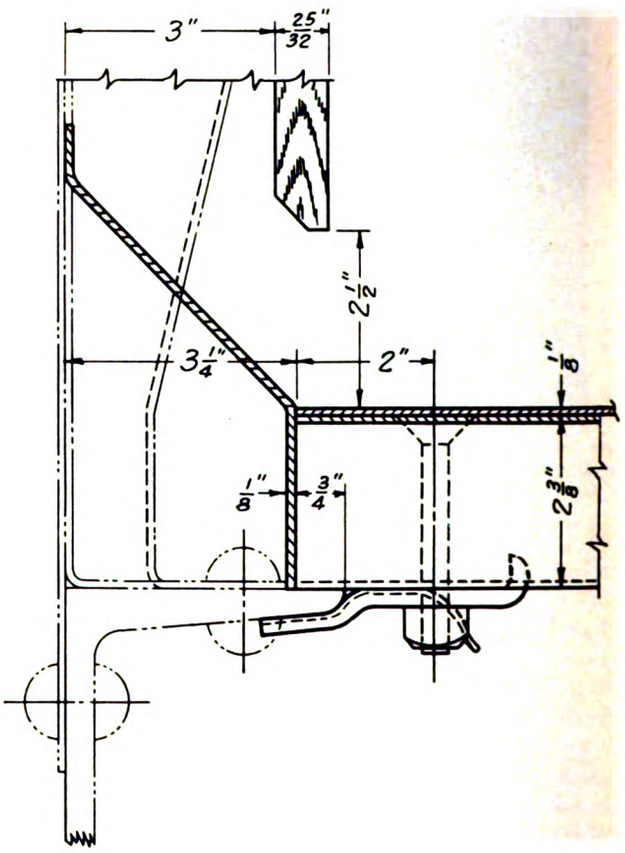


A blower at the refrigerating end of the car sends the cool air between (and to some extent over) the longitudinal Z-sections in the roof structure. In traversing the length of the roof most of the cool air peals off and proceeds down through the holes and between the inner and outer sides of the box; the remainder goes down a duct (3 in. deep by the width of the end) on the far end of the car. It returns to the blower along the entire width of the car underneath the flooring as shown in the section drawing.

ACL Tries New Type Flooring – Its Purposes:



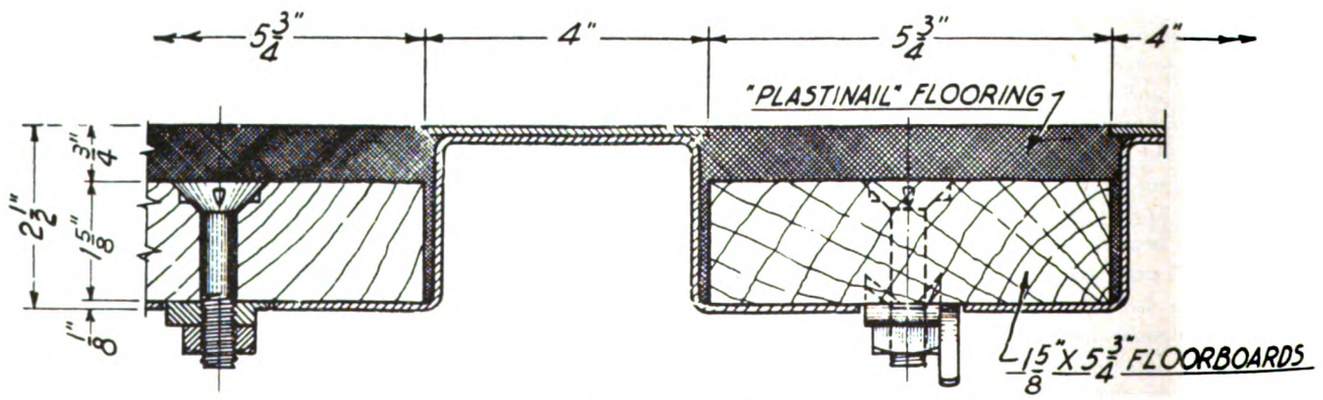
- To give nailable surface
- Impervious to oil and grease
- Smooth and watertight
- Reduce maintenance



The hat sections are welded to each side of the center sill, to the stringers and to the grain strips.

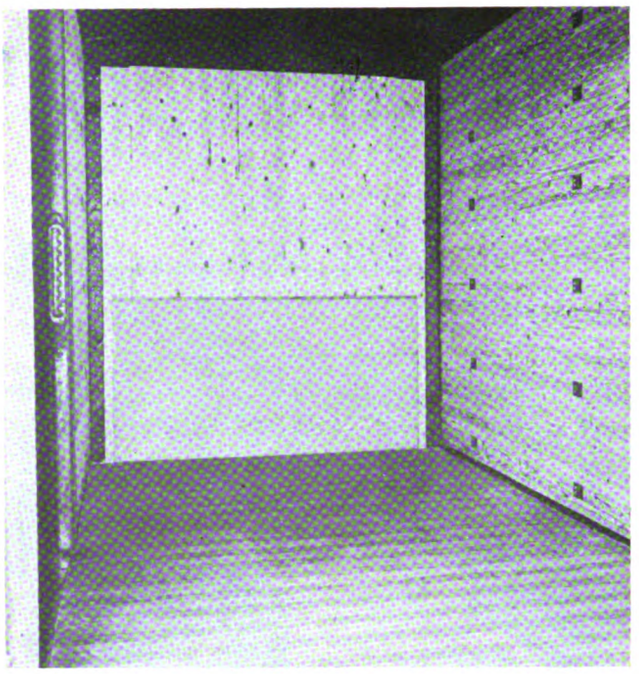
The ACL has already equipped 100 box cars and before the end of this year expects to equip another 200 cars with a new type floor it has developed. The road has applied for a patent on this flooring. It consists of steel "hat" sections between which are wood fillers that are capped with an inorganic composition containing calcium chloride and known as "Plastinail." The consistency of the Plastinail is about like plaster when applied but hardens to form a nailable substance that will also resist abrasion.

The new floor, which has a nailing area 60% that of



Wood filler blocks take up most of the space between hat sections; Plastinail, the rest up to level of top plate.

The pouring and initial troweling take two men about 45 min. The car is moved and the final troweling done an hour later.



The completed car includes lading strap anchors and a plywood protective section on the lower part of each end.

an all-wood floor, is being applied during general repairs at the Waycross shops. The steel and wood portions of the flooring are put on at positions where other work involved in the general repair is done. The Plastinail is then applied at a separate station by three men—one to mix and two to spread it.

The first step in laying the new floor is to weld a 2" x 2" x ¼" steel angle along each side of the entire length of the center sill to form an additional anchor for the steel-ribbed wood Plastinail flooring. Steel filler pieces are also welded to the bolster and crossbearer cover plates at center sill and floor stringer locations to form a continuous support for the steel floor hat sections. The metal grain strip that runs along each side is then fitted to the side posts and welded in place. The metal grain strip serves two functions—it makes a grain tight connection between the sides and floor of the car, and it helps to stiffen the car. The steel hat sections are then securely welded to the steel angles and steel filler pieces as well as to the floor supports and side sills in addition to welding the ends of the hat sections to the metal grain strips. The first hat sections to be applied are those at the door posts. Next come those between the door posts and the ends of the car. Last to go in are the hats between the door posts. The steel floor assembly will not only support heavily loaded fork lift trucks, but will also serve to strengthen the entire underframe of the car and make it more rigid.

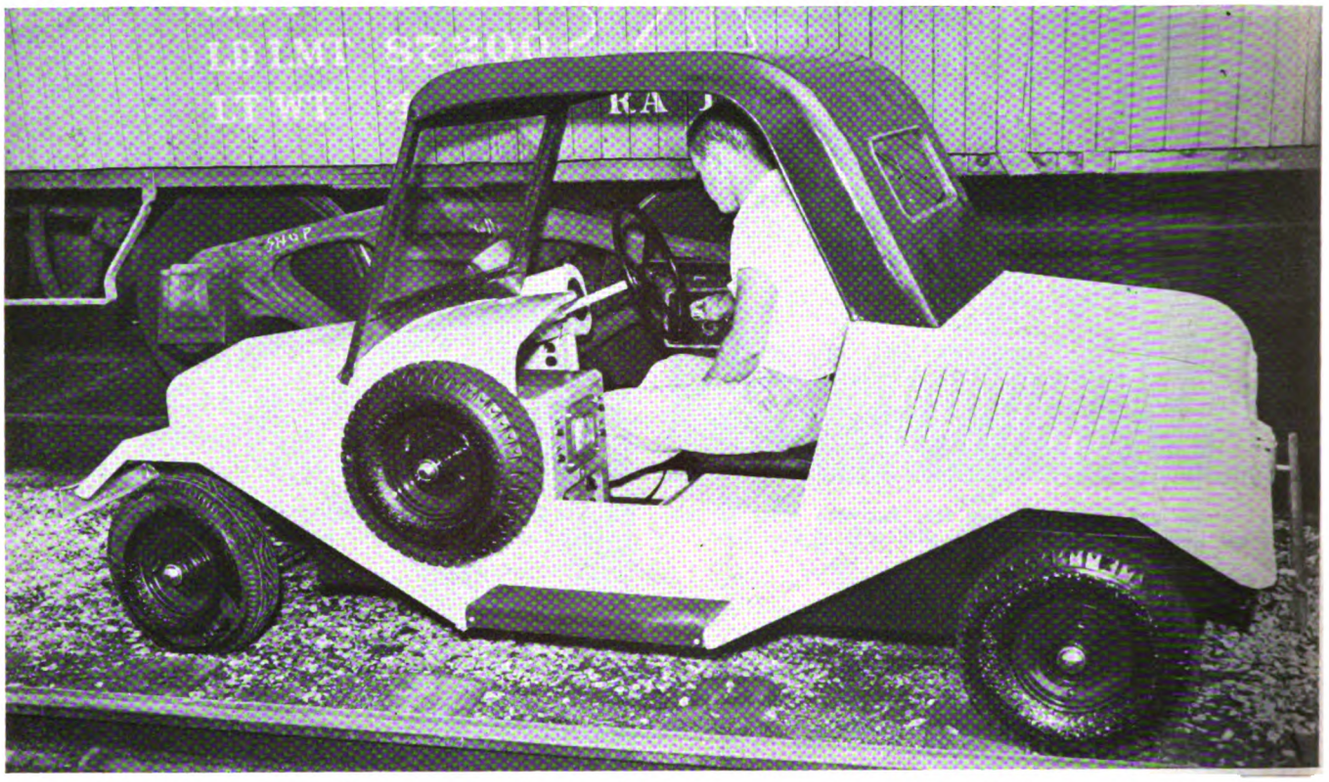
The wood filler planks are put in place and bolted down with floor clips to the side sills, floor stringers, and the top angles at the center sill. Then wire mesh is attached to the top surface of the wood planks with divergent staples. This is done by a fourth man working part of each day and using a heavy rubber mallet and a Spot Nailer that has a notch in the nose to straddle the wire. Hitting the nailer with the mallet sinks and spreads the staple, securing the wire mesh in place.

It takes about 45 minutes to pour the Plastinail and do the preliminary troweling. The whole floor is done at the one time. The car is then moved forward while the crew applies the material to the next car in the line. By this time the Plastinail in the first car has taken its initial set and is given a second troweling. The final troweling is necessary to get a smooth surface and one that is impervious to oil and grease. The material sets hard in 1½ hours at 90 deg., but takes up to 4 hours at normal inside shop temperature during the winter.

The metal floor rib consists of a preshaped ⅛-in. thick steel plate hat section with a ⅛ x 4-in. galvanized steel plate spot welded along the top of the full length of the hat section. It is purchased as a complete assembly. The galvanized top plate overlaps the hat section ⅛ in. on each side to make a continuous perfectly flat floor when completed. The hat section does not do this because of the rounded corners at its top. The top plates also serve to strengthen the load-bearing portion of the floor and, because of the ⅛-in. overlap, help to hold part of the filler material in place.

The floor design as finally adopted and applied to the 100 cars was developed from two experimental installations. The first car on which this general idea was tried had half the floor with the present combination of the steel sections, wood fillers and Plastinail. The other half of the floor used only the hat sections and larger cross-section planking to fill in between them. The wood and steel flooring did not work out very well because it was impossible to get a smooth surface between the wood and steel floor ribs with the result that gaps and cracks allowed moisture, grain and dirt to collect.

The first car also had slightly different thicknesses of wood and Plastinail—¾ in. and ⅝ in. This was changed in the second car to 1⅝ in. and ¾ in., and these dimensions were adopted as standard for the remaining cars. Although the floor assembly is being patented, there will be no royalty charges made against any railroad desiring to use this style flooring.



Mobile axle flaw detector permits the operator to make a rapid axle inspection. In the operator's field of vision are both the Reflectoscope search unit and the auxiliary viewing screen.

C & O Installing Fleet of Axle Flaw Detectors

Ultrasonic axle inspections are becoming routine mechanical operations at many terminals

Ultrasonic inspection is proving reliable in preventing freight car journal failures, judging by the experience of the Chesapeake & Ohio. After prolonged investigation and tests, C&O has installed a fleet of mobile axle flow detector units that are small motor vehicles carrying Sperry Reflectoscopes capable of testing without diassembly as many as 320 journals daily. Initial testing of 18,872 revenue freight cars of C&O and foreign ownership has disclosed 28 definitely cracked journals and 10 others with internal defects. C&O engineers say that any of these 38 potential failures could have caused a wreck.

The new C&O ultrasonic test program provides for regular use of the largest single installation of ultrasonic inspection equipment by any railroad. It developed from the determination of C&O management to apply technical knowledge to the development of tools and methods which effectively would reveal faulty journals in railway rolling stock and prevent such losses as the C&O experienced in a series of freight train wrecks in 1952. Investigation established that some wrecks were caused by broken journals and that these service failures were due to cracks that had existed previously.

Development of the program was made the responsibility of the C&O Mechanical Department. The objective was to devise an inspection method that was simultaneously practical, reliable and economical. Extensive research and investigation were projected and C&O's mechanical engineer, engineer of tests, and Sperry Rail Service participated.

Decision was made to investigate the possibilities of using the Sperry Reflectoscope, which is widely used for quality control, maintenance inspection and the testing of machine components without disassembly. It functions by beaming ultrasonic sound through metal, catching the echoes or reflections from even minute structural discontinuities and revealing their location and nature on a viewing screen. The capacity of the Reflectoscope permits metal parts as long as 108 ft to be tested for defects.

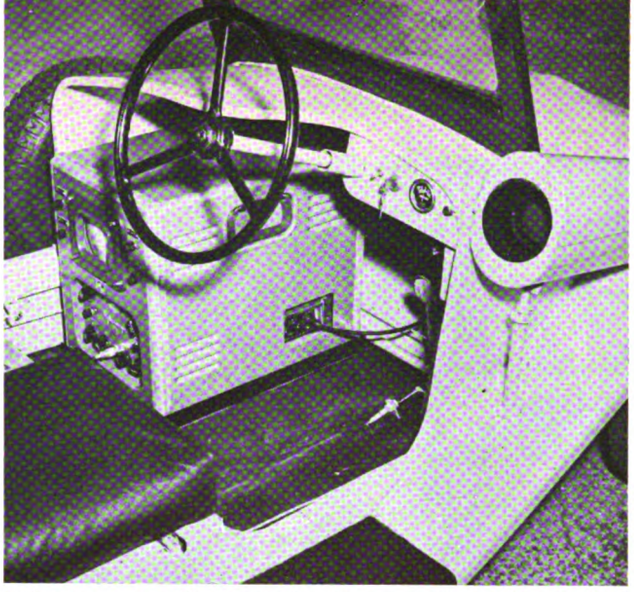
Preliminary investigation put the Sperry Reflectoscope to rigid tests. Large numbers of axles known to the engineering and tests departments to have cracks in journals and wheel seats were selected for testing. The journals and wheel seats were covered with tape, and both good and defective parts were mixed so that the investigators could not know which parts were defective or where defects might be located. Each axle was inspected by Reflectoscope and the indicated location of defects was marked on the tapes. Tapes were then removed and the location and nature of each crack verified by check against the records. This cross-check established that the

crack.

While these tests proved the ability of the Reflectoscope for indicating, locating and measuring structural discontinuities, the investigation proceeded to seek the answer to an important question: How would the Reflectoscope function with journal bearing, dust guards or sides of boxes in place? Wheels were mounted on axles with known defects and placed in truck side frames. The Reflectoscope identified the cracked journals among the four wheel sets tested showing that defective parts could be located even in complete assemblies. The complete truck presented no problem.

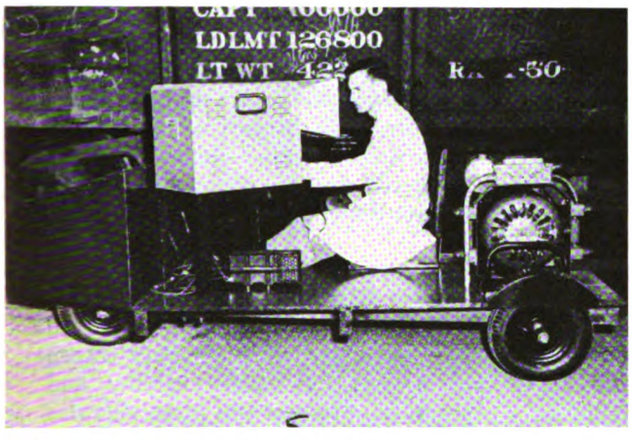
The investigation then went on to find how the Reflectoscope would function if there was a cracked journal under a freight car. Unknown to the investigators, the C&O engineer of tests had an axle with a cracked journal mounted with two wheels. The assembled unit was placed in a truck under a revenue freight car. The car was put in a line of cars, and the Reflectoscope picked out the cracked journal and even located and indicated the nature and extent of its defects.

Having established the effectiveness of the Reflectoscope, the program turned to the development of convenient and economical methods for testing freight car journals in yards with axles in place. It was decided that the Reflectoscope could be mounted on a self-propelled mobile carrier equipped with a portable, engine-driven generator furnishing current to operate the instrument.



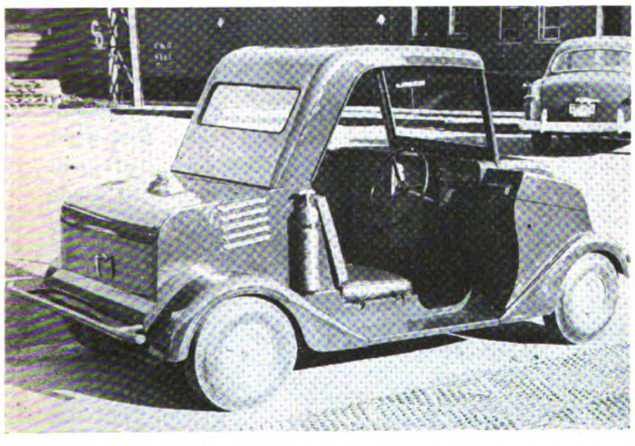
Reflectoscope is well protected by floor mounting and streamlined cowl. Seat can be adjusted to the side if necessary to bring operator closer to the journal.

Evolution of Mobile Axle Flaw Detectors . . .



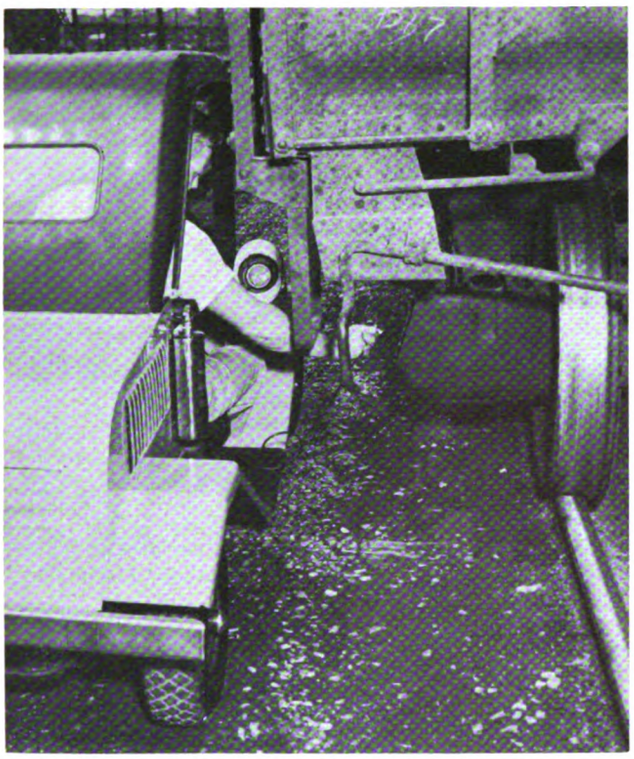
1. Progressed from woden mock-up . . .

2. Through first model built on commercial chassis . . .



3. To the first with the auxiliary viewing screen . . .

4. To today's streamlined unit.



Study of the problem and testing of various designs finally developed the current version of the mobile detector which seats operator so that he can drive the unit and inspect journals in minimum time.

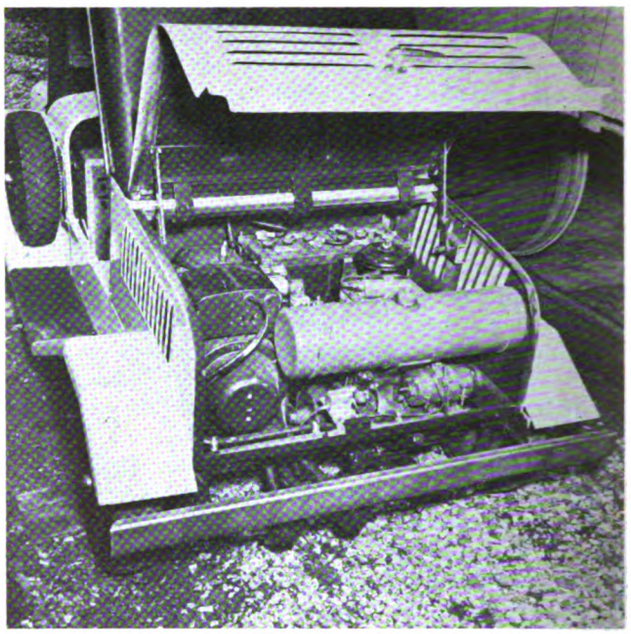
Many problems were encountered. The mobile carrier had to be built close to the ground so that the operator could reach the ends of car journals with the Reflectoscope search unit without leaving his seat. The carrier had to be easily maneuvered. The operator's seat had to be adjustable sidewise so that he could drive the car with the seat pulled out when journals were at distances from the runway.

In order to solve these problems, it was decided to construct a wooden, power-driven mockup equipped with electric generator and Reflectoscope. This prototype facilitated practical tests of the operation. Within ten days the unit revealed a defective journal in a revenue freight car. Removal of the wheels verified the existence of a long, circumferential crack.

The successful use of the mockup demonstrated the need for a more compact carrier. Search for a motor-driven chassis which could be revamped to meet requirements led to a chassis produced by King Midget Automobile Co., of Athens, Ohio. It was low, the drive engine was in the rear and design changes could be made without disturbing the drive mechanism.

This first standard mobile Reflectoscope carrier went into service at Columbus, Ohio. Within eight days it located a cracked axle. On the strength of its satisfactory service, construction of two additional carriers was begun. Upon completion in December 1954, one was assigned to Newport News, Va., and the other to Columbus. A fourth was constructed and assigned to Newport News in June 1955.

Operating experience with these carriers indicated the need for more changes. Location of the Reflectoscope on the front hood required the operator to look first at the journal when placing the search unit and then back at the Reflectoscope viewing screen. One of the mobile

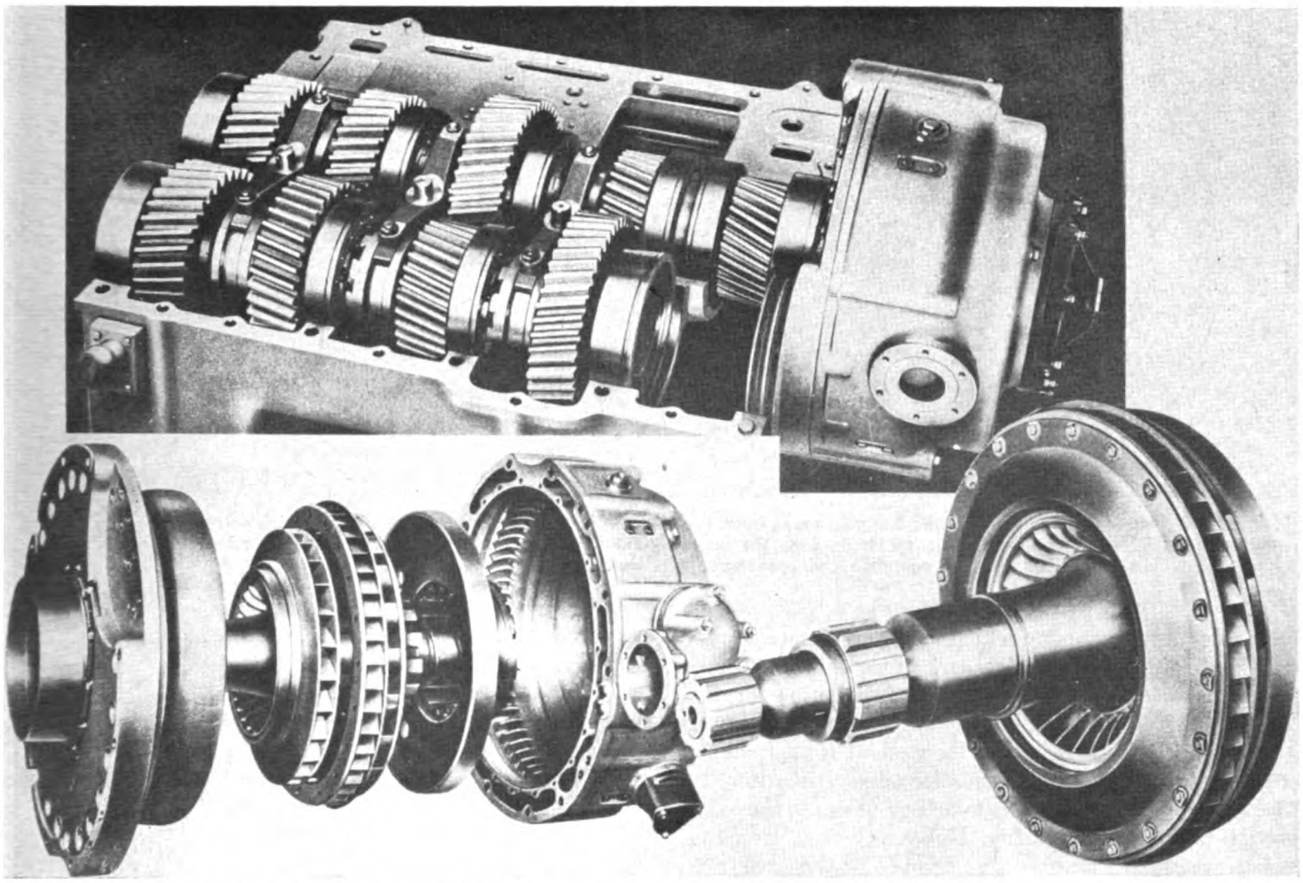


Two gasoline engines are installed at the rear of the car. One drives the wheels and the other drives a generator suppyling power to the Reflectoscope. Gas tank and battery are also fitted in.

carriers at Columbus was selected for further improvement. The frame was lengthened to provide more leg room. The Reflectoscope was shifted to a protected position on the floor. Sperry Rail Service developed and adapted an auxiliary viewing screen to be mounted on the right front fender directly in the operator's line of vision. The vehicle was streamlined for better appearance and utility.

Continuing improvements were made with the cooperation of the C&O, Sperry Rail Service and the vehicle manufacturer. The Reflectoscope was given the added protection of an extended cowl. The auxiliary screen on the fender was hooded for better visibility and streamlined for appearance. The seat was given sidewise adjustments so that the operator can easily reach any journal. These changes make is possible for the operator to apply the Reflectoscope search unit to the journal while keeping his eyes on the auxiliary viewing screen. The vehicle, low-hung and compact, easily travels beside repair tracks. Six more mobile axle flaw detector units, each equipped with a Sperry Reflectoscope, were delivered at Huntington, W. Va., in mid-June 1955. The fleet went into full-time service July 25th, with two in operation at Walbridge, Ohio, and single cars assigned to C&O yards at Stevens and Russell, Ky., and at Grand Rapids and Saginaw, Mich.

Six mobile detectors were delivered and went into service at four C&O terminals in July. With these, and those previously installed, C&O is said to be largest railroad Reflectoscope owner.



Mekydro Type K104 transmission with the upper portion of housing removed. This model is capable of transmitting 1,000 hp. Below is an exploded view of the hydraulic portion of the transmission. At the lower right are the pump wheel and turbine wheel of this disengaging converter.

Army Transportation Corps Shows U.S. . . .

What Mekydro Torque Converter Can Do

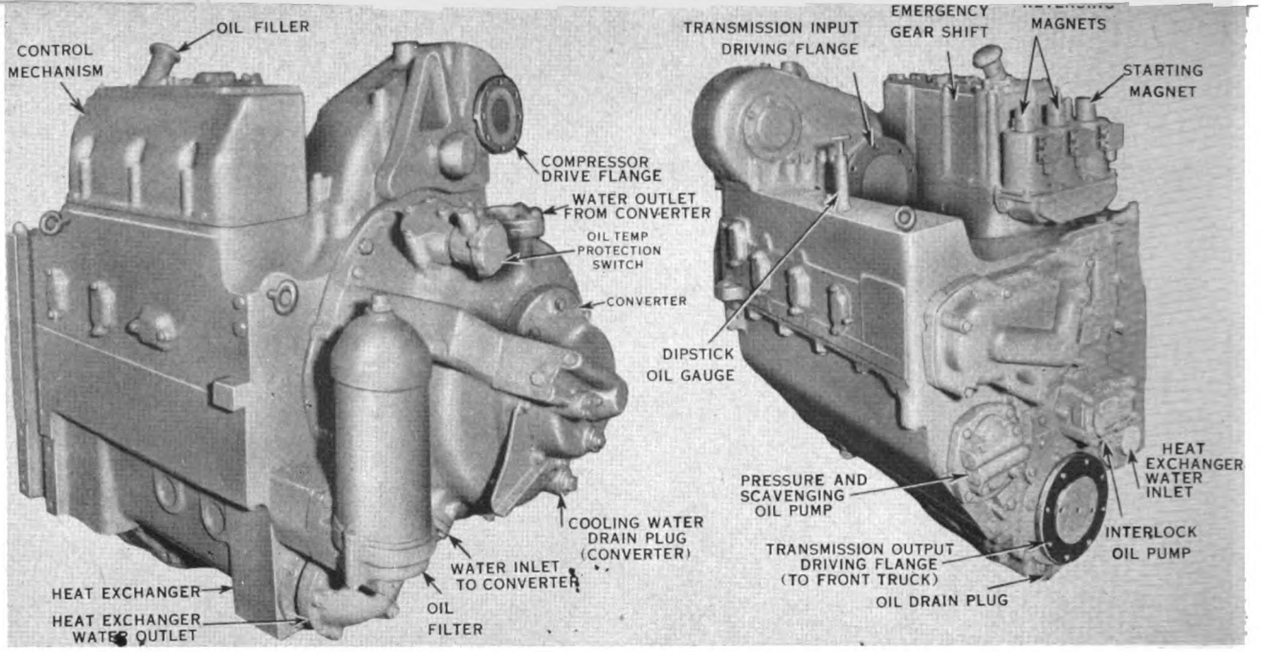
Baldwin-Lima-Hamilton builds GI diesel locomotive which will soon be followed by diesel-mechanical passenger units for the New Haven and New York Central light-weight trains

A 52-ton switching locomotive now working around the plant of the Baldwin-Lima-Hamilton Corporation at Eddystone, Pa., is driven through the same type of torque converter which will drive the high-speed locomotives that Baldwin is building for the lightweight Pullman-built trains of the New Haven and New York Central. The Mekydro torque converter was developed by Mayback of Germany, and Baldwin is licensed to manufacture and sell it in the United States. The high-speed locomotives will have a light-weight German-built diesel engine instead of the Caterpillar D-397 used on this recently completed Army switcher, which is numbered 1281.

At the same time that Baldwin was delivering the 1281, W. J. Harlow, general mechanical superintendent of the New Haven, was completing a trip to Europe and he has now submitted a report on German diesels to Harvey E. Hales, the New Haven's chief mechanical officer. It says that the diesel engine with mechanical transmission has been used with great success on the German Federal Railways. Many locomotives rated at 2,000 hp with a 1,000 hp diesel engine and mechanical transmission directly mounted on each truck are in service. Engines produced by Damlier, Benz, M.A.N. and Fiat for the German Federal Railways are all interchangeable. German standardization has been achieved not only in engines, but also in transmissions and related equipment. Mr. Harlow stated that "mechanical drive is here and it would be well for America to recognize it."

Army Switcher Is a Lightweight

United States Army's quest for a lighter weight locomo-

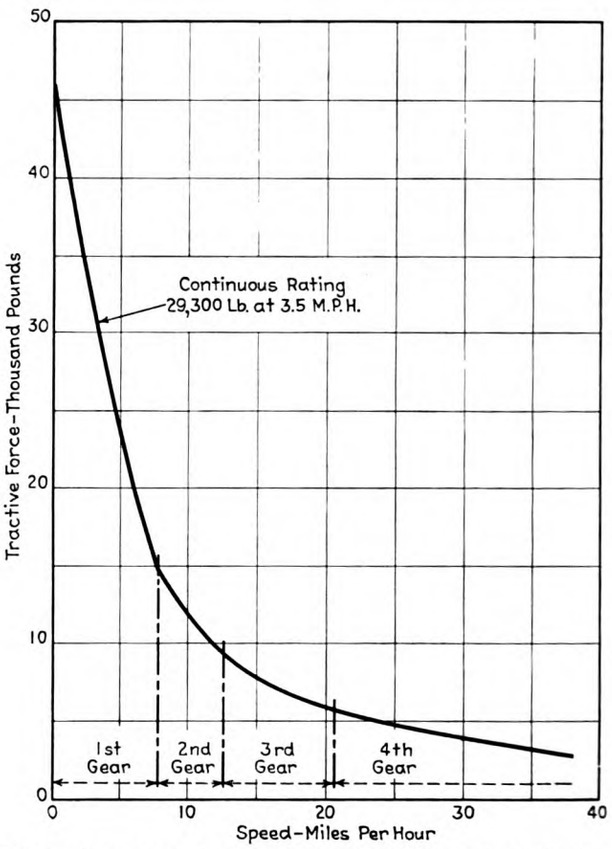


Mekydro multi-speed mechanical-hydraulic transmission as seen from opposite sides. Three sizes of this unit are made with the largest capable of transmitting 1,000 hp. The operation and appearance of each is the same as the one shown which was used on the 400-hp Transportation Corps switcher. The unit permits multiple-unit operation.

tive having a transmission which needs less strategic material and fewer skilled maintenance men than the diesel electric resulted in Baldwin's first installation of the Mekydro drive. While the Mekydro torque converter is completely German in origin, the method of applying its output power to the axles of this locomotive is primarily American. German practice is to deliver power to the axles through helical bevel gearing. This means that dropping an axle requires extensive disassembly of the gear box and drive shafts. Army specifications called for an arrangement which would permit the axle to be dropped out of the axle drive unit with the same ease that it would be removed from an electric traction motor. This requirement has been satisfied by a new Baldwin-Maybach design which even uses Westinghouse pinion and bull gears and regular traction motor support bearings.

This torque-converter locomotive is nearly the same as the Army's standard 60-ton 400-hp overseas standard and broad gauge diesel electric locomotive—a model which Baldwin has previously built in large numbers. The 1281 was designed to incorporate the same operating features including adjustable wheel spacing, multiple unit operation with all other overseas locomotives, light axle loading, restrictive clearance, and service in a wide range of ambient air temperatures. This new locomotive is 8½ tons lighter than the previous Baldwin-built GI diesel electrics not only because of the torque converter, but also because of a smaller fuel tank and extensive use of aluminum throughout the locomotive.

Above its welded steel frame this locomotive is arranged much the same as a diesel electric. The principal difference is that the Mekydro unit takes the place of the main generator. All the auxiliaries are about the same—air compressor, auxiliary generator, radiator and fans. The electrical cabinet is greatly simplified, but the diesel engine is fitted with two electric starting motors. The Mekydro unit does not require a load regulator and

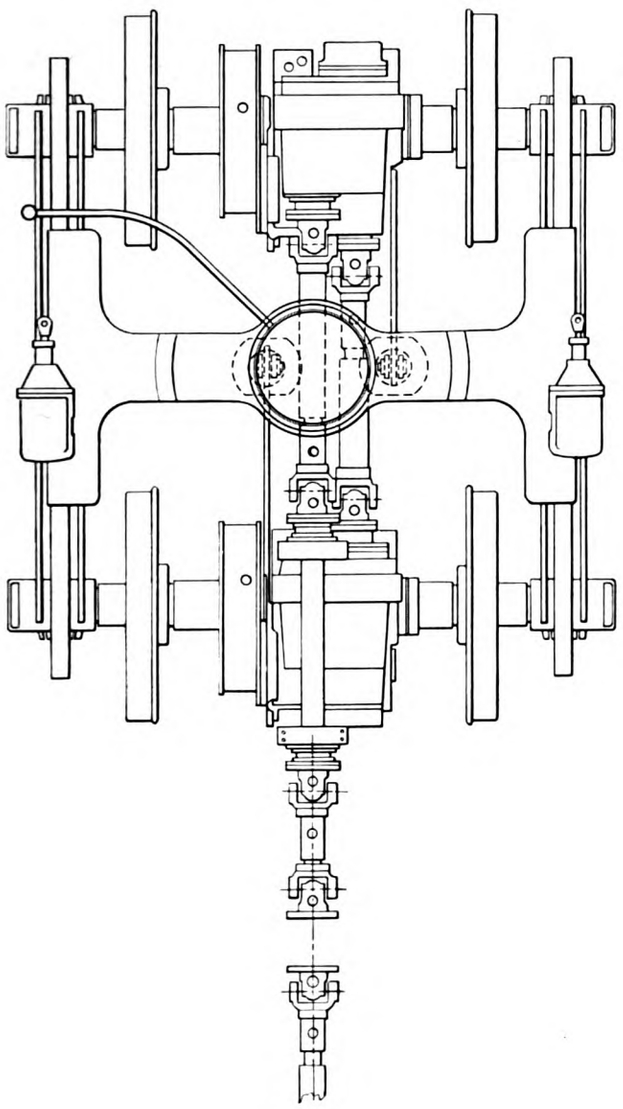


Tractive-force curve shows the speeds at which each of the four gear combinations drives the locomotive. Mekydro characteristics permit smooth gear shifting. This transmission has a continuous speed about one-tenth that of the maximum speed.

so the Woodward UG-8 governor is only arranged to control the admission of fuel to the diesel engine.

The 350-gal. fuel tank and a 64-volt battery are located

below the locomotive frame. In addition, there are a series of shafts, couplings, universal joints and pillow blocks necessary to transmit the power from the Mekydro torque converter to the axles. To allow this locomotive to traverse a 75-ft radius curve, it was necessary to couple the primary output shafts to the axle drive units on the outer axles at each end and then have secondary power shafts drive back to the inner axle on each truck. The primary drive shaft passes through an opening in the body center plate assembly and the secondary shaft passes through a hole in the truck bolster. A torque reaction member extends from the axle drive unit to the bolster and is secured by a cushioned link. This has same function as the spring nose suspension of the electric traction motor.



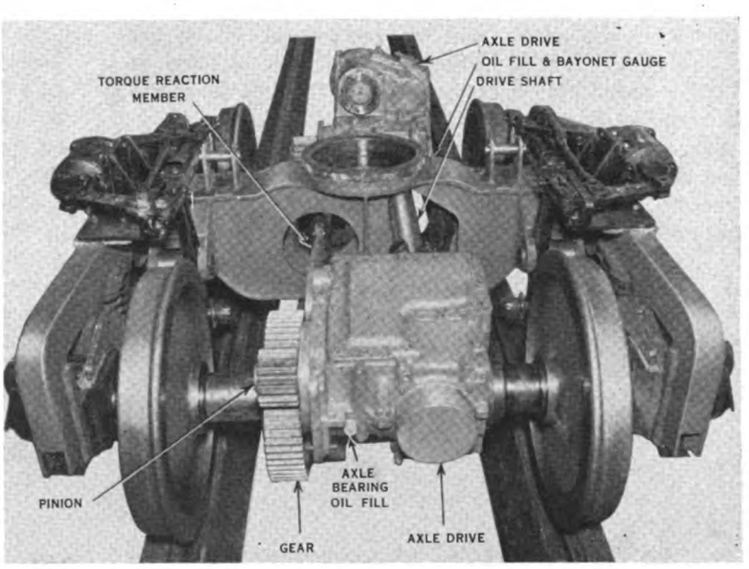
Mekydro for Locomotive Service

The Transportation Corps announcement concerning their diesel-mechanical locomotive states that the decision to use the Maybach Mekydro transmission "was based on an extensive investigation and engineering study which

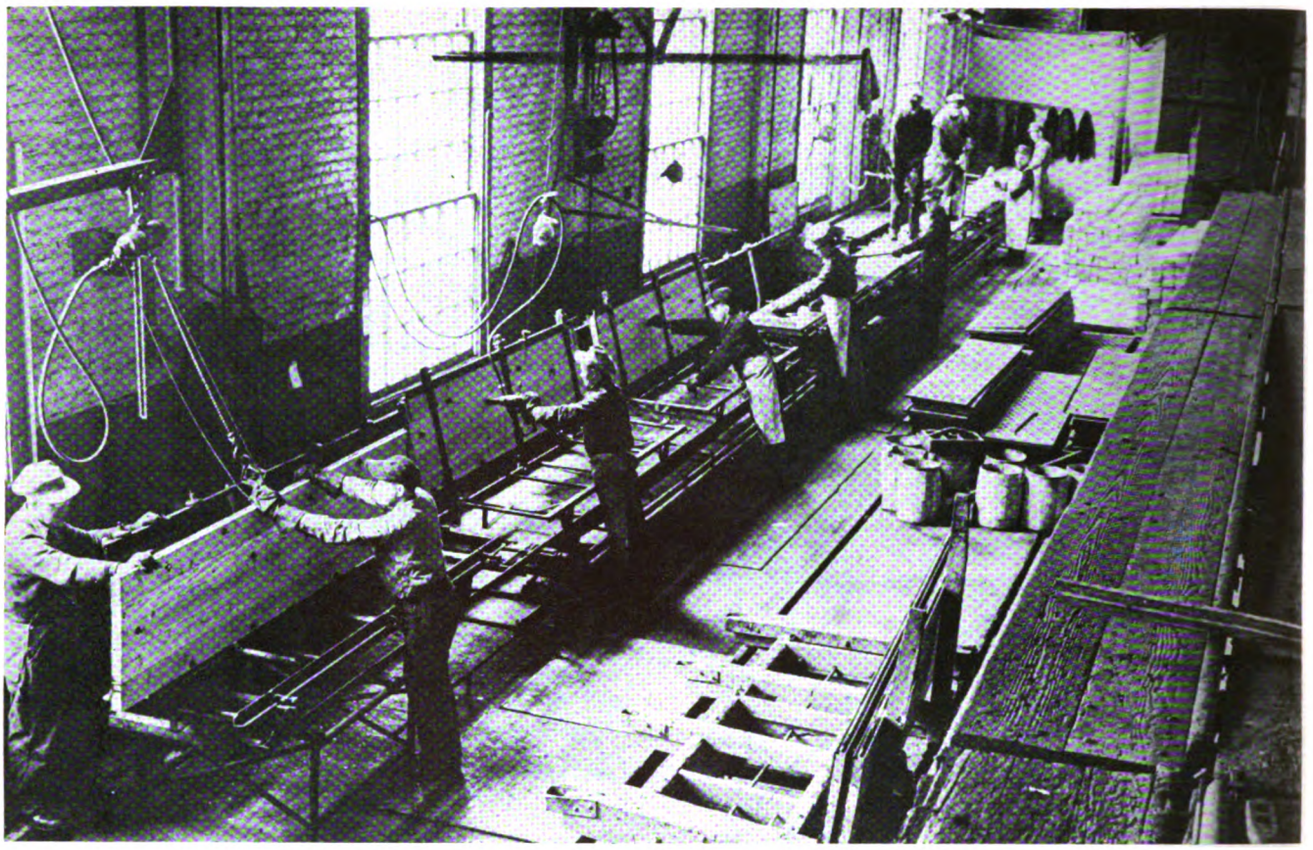
(Continued on page 87)

Locomotive Characteristics

Type	0-4-4-0 (BB)
Horsepower for Traction	400
Gauge (Adjustable), In.	56½, 60, 63, 66
Weight in Working Order, Lb.	104,000
Length Inside Pulling Faces, Ft-In.	40-5
Truck Wheelbase, Ft-In.	6-11
Overall Width, Ft-In.	9-6
Overall Height, Ft-In.	13-4⅜
Wheel Diameter, In.	40
Engine:	
Manufacturer	Caterpillar
Type	4 Cycle Vee
Cylinders	12
Bore and Stroke, In	5¾ x 8
Brake Horsepower	500 @ 1,200 RPM
Idling Speed—RPM	450
Weight, Lb.	12,100
Transmission:	
Oil Capacity, Gal.	22
Weight, Lb.	3,450
Gearing	17 to 63
Maximum Speed, Mph	35.
Continuous Speed, Mph	3.5



Axle drive on four-wheel truck of army switcher viewed from the center of the locomotive. Input shaft passes over the center plate to the drive unit on the axle at the far end and then a secondary shaft comes back through the bolster to the inner axle drive unit. Illustration right shows the axle-drive gear case removed. Wheels can be respaced out to 66-in. on this truck.



Half the cars get Nailable Steel Floor, the other half wood floors with steel plate pre-assembled into panels. The latter operation is done on an assembly-line basis at the stations shown.

Two Features Distinguish New GN Car Shop

1—The Way Cars Are Built

2—The Unique Welding Layout

Cars are built different up on the Great Northern—in the new shop building at St. Cloud, the men assemble the body along one side, the underframe along the other, and the trucks in the middle. The underframe is then hoisted on the trucks, and the body is placed on the underframe. This completes the basic car, although a number of finishing operations remain on both the inside and outside (floor, lining, brake rods, etc.).

The principal reason the GN builds cars like this is that the body can be supported on low dollies rather than trucks. Thus, working heights are lower, and the men can do about half the work without scaffolding.

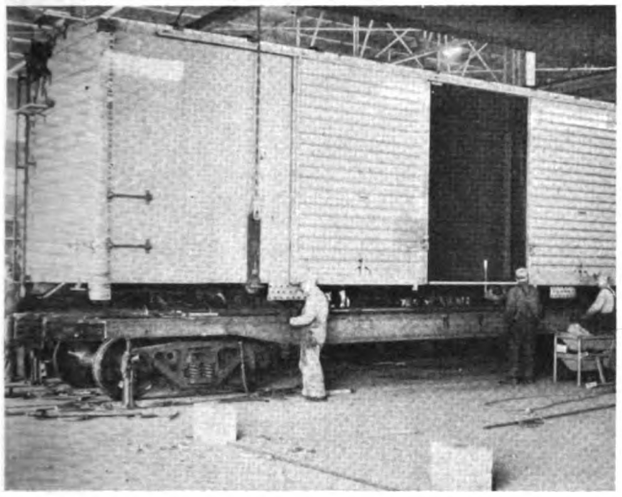
The overall building of the cars can be considered as divided into the five parts shown on the diagram—underframe parts, center sills, trucks, bodies and final car work. Details of these operations are covered in two of the accompanying boxes.

Flexible Welding Layout

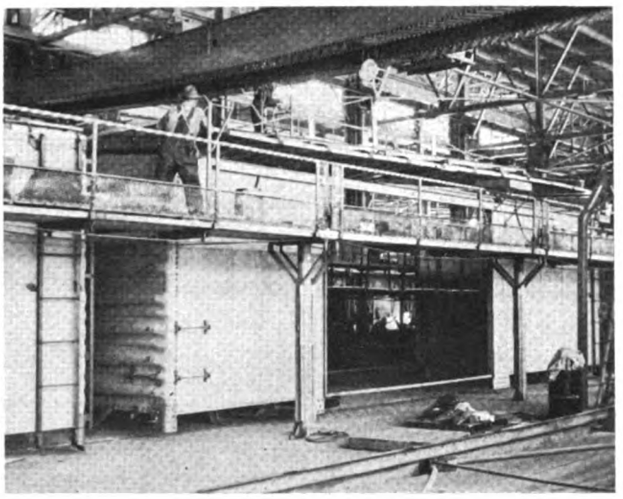
Heart of the welding layout is a group of 24 welding panels scattered throughout the shop. Each panel provides up to five outlets for plugging in electrode cables. There are also 26 floor outlets of two receptacles each, 22 well and 12 wall outlets of two to four receptacles each. Current is supplied to all these receptacles by welding machines located above the panels on steel platforms attached to main building columns.

Plans are underway to put lights over each receptacle to show whether a welding machine was in use, and whether the welder forgot to pull his plug out. These lights would also caution the welder against pulling his plug out underload, causing an arc from currents up to 125 amp.

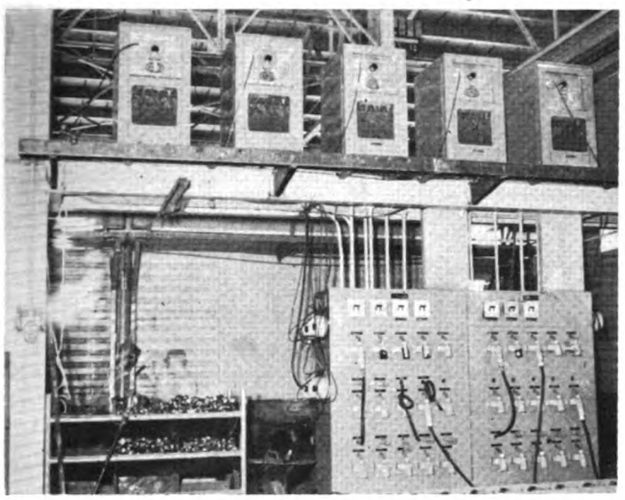
The welding stations are connected to the floor, well



Instead of attaching the sides, ends and roof individually to the underframe, the entire body is assembled separately and lifted in place. Among the advantages of building a car this way is that . . .



The body can be supported on low dollies instead of trucks, giving a lower working height and letting one do half the work without scaffolding

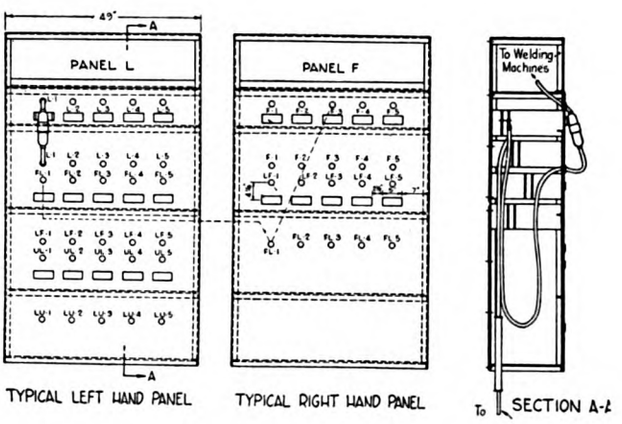


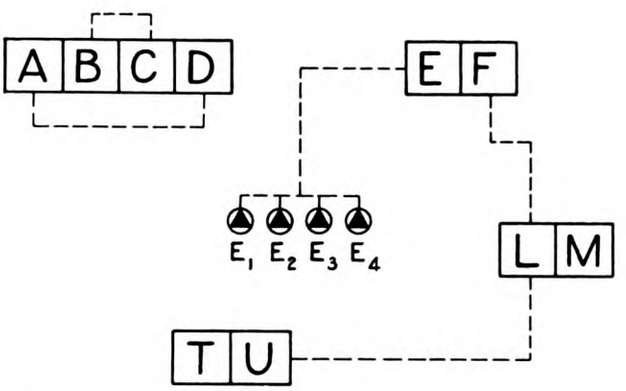
FEATURES OF WELDING LAYOUT INCLUDE:

- **All welding machines and most cable off the floor**
- **Receptacles within a few feet of any point in the shop**
- **No accidental overloading as only one outlet per welding machine. Yet complete flexibility because of . . .**
- **A simple, easy-to-make method of interconnecting selected panels so that a welding machine at one location can supply current to a point a hundred or more feet away through a series of underfloor cables.**

and wall outlets by permanently connected under-floor cable. Selected panels are also interconnected with other panels so that if no welding machine is available to supply current to a particular panel, a connection can be made at that station panel to utilize current from a welding machine at a remote station.

To weld at a given panel, (L is shown in the example in one of the illustrations), there are five welding machines, and five outlets. The first five men who want to weld from panel L merely plug into a receptacle direct-connected to one of the five welding machines at L. But if a sixth man wants to weld from L, all the outlets will be taken. Yet he can still draw his power from the panel at L without having to string electrode cable along the shop floor all the way to the nearest unoccupied welding machine. Instead, the sixth welder merely plugs his electrode cable into an extra outlet on panel L (FL-1 shown)

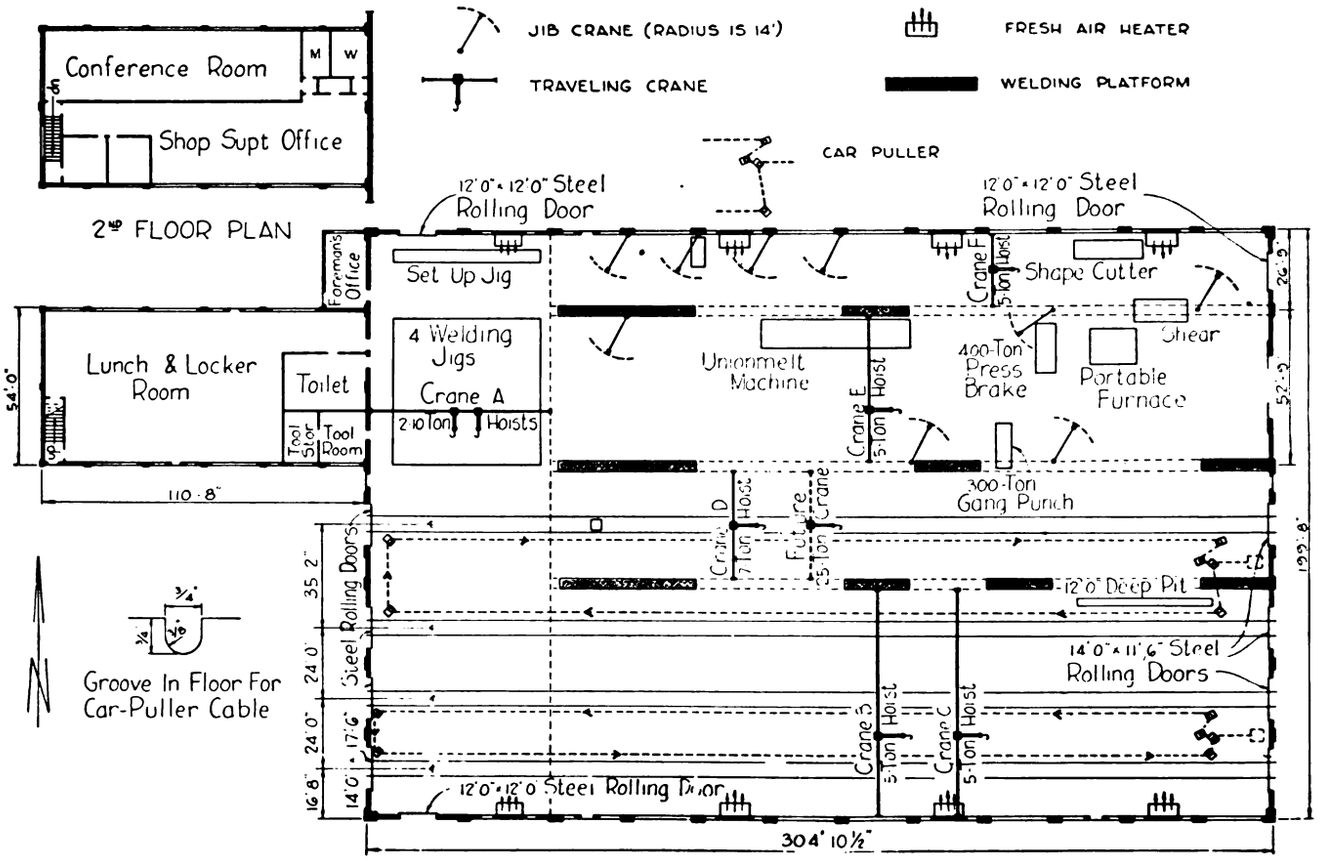




Flexibility in welding—To weld from Panel L with current furnished by a machine at F, the electrode cable is plugged into receptacle FL-1 on Panel L. This is permanently connected by an underfloor cable to FL-1 on Panel F. This end of the connecting cable is a plug, which is inserted into any available welding machine outlet (F-3 shown), and welder 3 at Panel F now supplies outlet FL-1 at L. The LU and UL designations on Panel L indicate a similar tie-in to Panel U.

and hooks up the inter-connection at the remote station (FL-1 to F-3 on panel F is shown) which has the available welding machine that will furnish him current from panel L.

This interconnection FL is merely a cable permanently mounted under the floor with a receptacle at one panel



Underframes are made in the upper, or north, half of the shop. Generally speaking, the center sills are made in the lower portion of this section, other underframe parts in the upper part. There is some overlapping, however, e.g., the gang punch handles both the center sill and other underframe components. The two are tackwelded together on the set-up jig, finish welded on one of four rotating jigs.

The center sill is assembled from right to left in a straight line except for a jog to go through the Unionmelt machine. Movement along the last third of the line is by roller conveyor, staddling which is a drill press that bores out the holes for the draft gear carrying strap. Several interesting jigs shown in the illustrations are used along this line. Division of work on the underframe parts between the different pieces of machinery is as follows:

Shapecutter:
- **Cuts side sills**

17-ft Shear:
- **Cut top and bottom cover plates for body bolster**
- **Cut cross bearer tie plates**
- **Cut cross bearer top and bottom plates**
- **Cut side bearing stiffeners**
- **Cut center sill faces**
- **Cut AB brake fastenings**
- **Cut sole plates**
- **Cut rod carriers**
- **Cut lever carriers**

400-ton press:
- **Bend (cold) sole plates**
- **Bend bottom bolster cover plates**
- **Bend cylinder brackets and valve brackets**

200-ton punch:
- **Punch end sills and Z-bar stringers**
- **Punch top cover plates, cylinder brackets and valve brackets**

300-ton punch and shears:
- **Punch center sills, end sills, side sills and sole plates**
- **Punch bolster bottom cover plates, bolster web plates, crosstie web plates, crosstie bottom and top plates**
- **Nibble out for cylinder brackets**

Drill press:
- **Bore holes in center sill for draft gear carrying strap**

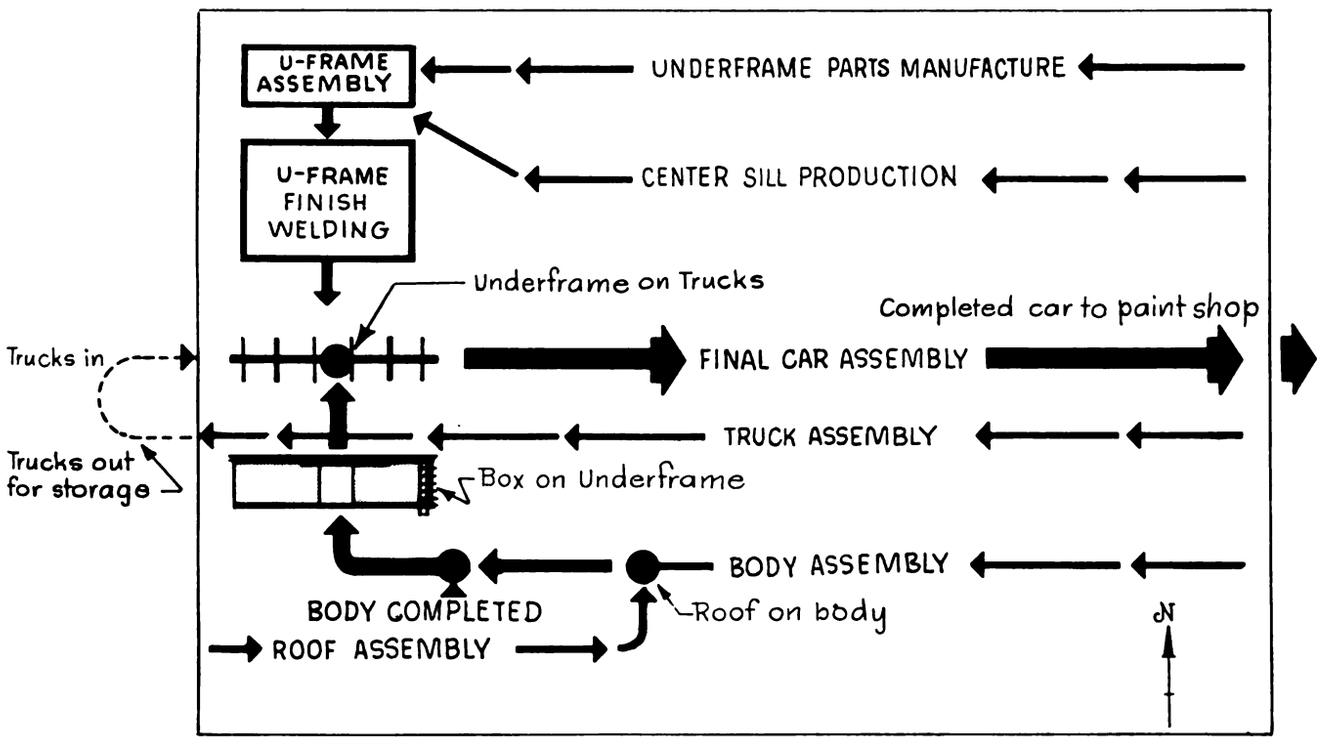
Diaphragm fabrication jigs:
- **Weld center braces, striking castings, center sill spacers and lever carriers**

There is also a space below the portable furnace (not used in this program) to prefabricate slack adjuster weld couplings and angle cock brackets, a ladder jig in the blacksmith shop, and several jigs for manufacturing major underframe components like body bolsters and crossties.

end (the panel near the welding operation to be performed) and a plug on the end at the second, or remote panel, from which the current will be furnished.

This simple system of designating plugs and receptacles is one key to the success of the layout. The order of the letters tells which the symbol indicates—plug or receptacle. Where the panel letter appears first (FL on panel F), it indicates a plug. Where it appears last (FL on panel L), it indicates a receptacle.

Thus, the welder can take advantage of the system's



HERE'S HOW IT'S DONE—Center sills and parts that go on it (bolsters, cross-bearers, end and side sills, etc.) are made along north side of shop, and the underframe assembled in northwest corner. Bodies are made along other side, with roofs put on halfway down the line. In the middle of the shop the underframe is put on the trucks and the completed body on the underframe. Finishing steel jobs are done as the cars proceed eastward and out of the shop for painting and lumber work (side and end linings, routing boards, etc.).

Roofs are built at three stations along what is the lowest track in the diagram, beginning at the left. The first station is a jig for assembling the parts, the next two for riveting. Roofs are stored waiting for application directly below the location on the next track where they are applied to the body.

There are six positions on the body assembly track. In the first, the sides and ends are erected and held in place by a couple of braces for temporary joining by fit-up bolts. The sides and ends are riveted together in the second position, and the ladders applied. The roof is put on at the third station, fitted at the fourth and riveted to the body at the fifth. The sixth position is for storage (more is available on the extension of this track outside the building). Movements along this track are with the car supported on special low dollies.

The trucks are built along the next track, and they, the body and the underframe (built in the upper. or north side of the shop) are brought together on a track running through the approximate center of the building. Five more stations complete the work done on the car in this building—two for fitting and welding, one for air brake work, one for applying doors and brake rods and the last for adjusting side bearings and inspecting the car. A 216-ft pit runs under the last five stations on this track. Remaining work on the cars is done either outdoors or in an adjoining building known as the wood car shop.

Movement along the different lines is by car-puller cables arranged in two endless-type systems, each serving two tracks and operating in opposite directions

flexibility by remembering only three things. First, he looks for an empty direct outlet from a welder in the top row of receptacles (L-1 to L-5). If these are all in use. he plugs into one of the second row (FL-1 to FL-5), say FL-1. Next he goes to F panel and locates the other end of the cable by finding the *plug* with the same designation. Finally, he takes plug FL-1 and inserts it into any empty welding machine outlet at F (F-3 is shown). He is then drawing welding current from the third welding machine on F panel through an outlet on L panel with no more external cable than if the current were coming from L.

Additional Flexibility

If all machines at F are in use, power can be taken from U in the same manner. The double tie-in on L (to U and to F) serves another purpose. If a man wishes to weld from U, but finds all machines at U and at L are in use, he can connect U to F through L and thus get his current from two panels away instead of one. The double jump requires but four steps:

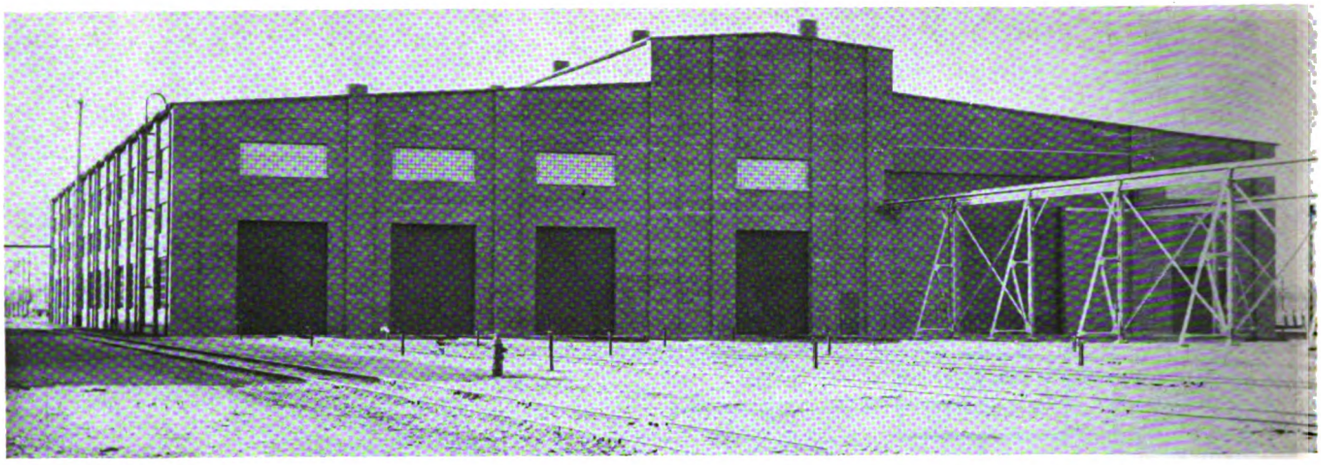
1—Plug electrode holder into LU-1 on U panel (or LU-2, LU-3, etc.)

2—Take plug LU-1 on L panel and put it in an FL receptacle, say FL-4.

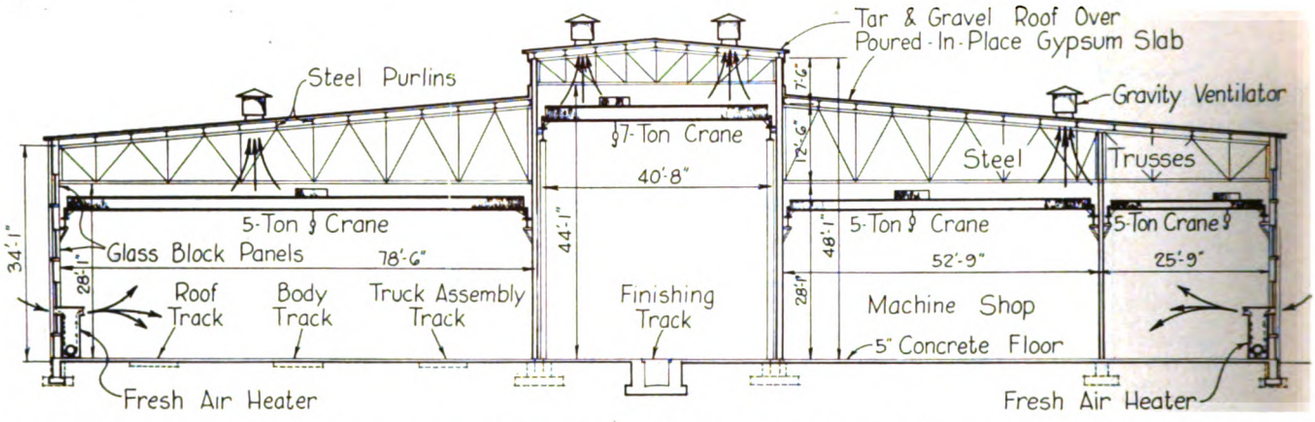
3—Plug FL-4 on F-panel into any machine available at F.

4—Start the machine, making current from F available at U.

Additional sources of welding current for the spaces in-between the 24 panels are provided by 26 floor outlets of two receptacles each, 22 well and 12 wall outlets of two to four receptacles each. Some panels have an extra five plugs each for the in-between receptacles. T is



Heavy materials (steel plates of all sizes, side-sill channels, center-sill Z-sections, etc.) are stored outdoors east of the shop and are moved into the shop at night on the 175-ft extension of the crane runway



Ventilation is combined with heating in a pressure-type system. Fresh air is drawn in through louvers in sidewalls by four individual units located at intervals along each wall. The air is heated as necessary by the units, then blown out into the shop area. Exhaust is through gravity-type ventilators in roof.

one such panel, and the extra plugs on it are numbered T21 to T25.

When a man wants to weld from floor receptacle T-25, he plugs his electrode holder into that receptacle. Going to T-panel, he takes plug T-25 and inserts it into one of the welding machine outlets (T-1 to T-5), the same way that plug L-1 was put in receptacle L-1. If all machines at T are in use, T-25 would be plugged into one of the interconnection receptacles (an MT designation), and the same procedure followed for remote power supply as was done between L and F.

The number of direct interconnections can be approximately doubled by taking advantage of the cable length. This is about 5 ft, or long enough to plug into receptacles on the adjoining panel (E to F, L to M, T to U, etc.). Therefore, each panel has the interconnection for which it is wired directly plus the one to which the panel next to it connects.

One Group Isolated

The one exception to the interconnections described above is panel group A, B, C and D. A and D, and B and C are joined, but none of the four connect with any other location. These panels supply current solely for tacking and finish welding the underframe.

The Shop Is Well Equipped

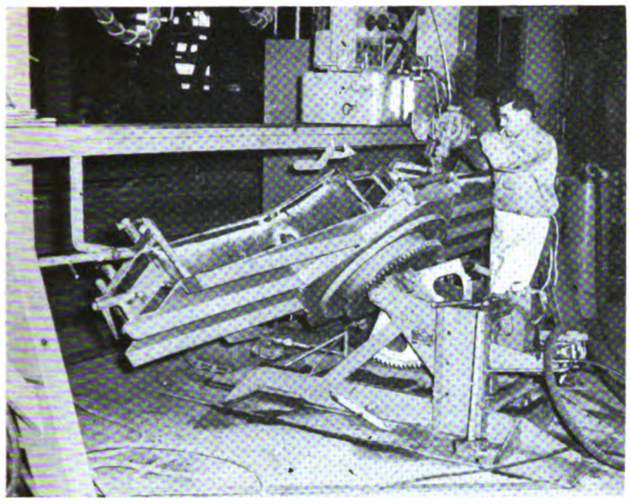
The shop—which has a working area 200 by 305 ft and a 54 by 110 ft extension on one side for locker room and office space—provides four through tracks with openings in the end walls fitted with motor-driven overhead rolling steel doors. One of the tracks is served by a pit 260 ft long for underside work on completed cars. Six overhead traveling cranes have been installed to serve various areas of the shop. In addition, 2-ton capacity jib cranes with 14-ft radius are mounted on building columns at strategic points around the machine shop area.
overhead travelling cranes have been installed to serve

One of the travelling cranes extends 175 ft east of the shop into the outdoor storage area where the GN keeps all sizes of steel plates, heavy channels, Z-sections for center sills and other heavy material. Movement of all this material into the shop is by the travelling crane, and it is done at night so that the men do not have to clear the area under the path of the crane with its heavy load.

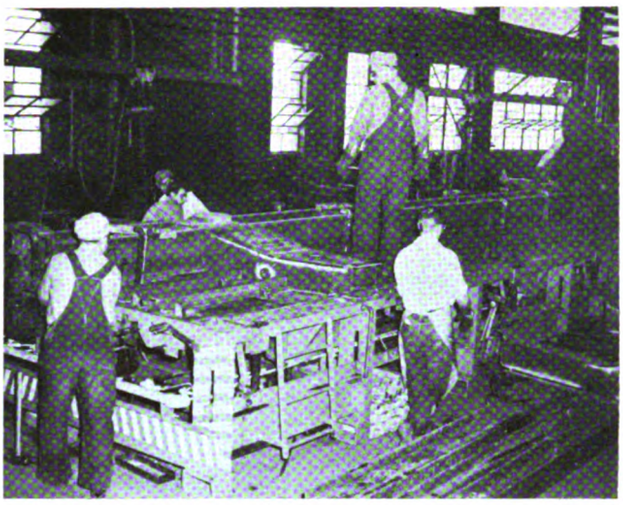
The floor of the shop is a 5½-in. reinforced-concrete slab, coated with a hardening agent. Sleeves of 8-in. pipe have been placed in the concrete floor along each side of the shop tracks to hold the legs of the portable scaffolding used in working on the tops and upper sides of cars. The pipe sleeves are placed flush with the floor 7 ft 8 in. from the center line of the tracks at 18-ft intervals.

Two Car Puller Systems

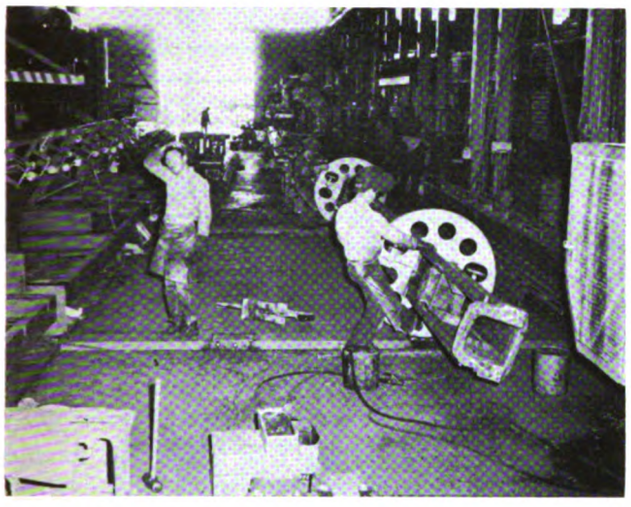
Movement of cars, unmounted bodies, roofs and trucks



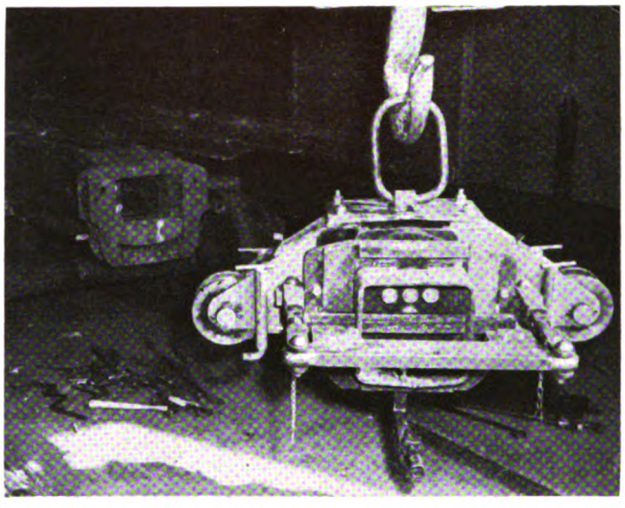
Typical of the specialized jigs for many operations is this positioner for welding the side bearing wedges on the bottom bolster cover plate



After the center sill is completed, it is placed in the set-up jig along with the crossbearers, body bolsters, stringers, end and side sills, etc. These are tack welded together in this jib . . .



After the two Z-sections are welded together in the jig at the left, the center sill is rolled to the right so that cover plates and other parts (center braces, striker castings, spacers and brake lever carriers) may be welded on downhand. It is then transferred to the roller conveyor a little further to the right. Two more operations complete the sill—drilling the holes for the draft gear carrying strap and applying the draft gear



Then a "spinner" like this is inserted in each end of the tacked underframe structure to allow it to revolve about its own axis for downhand welding after it is moved to one of four adjoining welding jigs where welding is completed. On the spinner, the large plate goes through the draft gear slot, the smaller bar through the striker. The bottom clamp goes under the striker, and the spinner is tightened in place by turnbuckles

is by two winch-type car pullers, at the east end of the shop, each serving one of the two pairs of tracks. The car-puller systems are endless, the cables being run from the winches through pulleys located at the opposite end of the shop then back to the winches again. The endless cable moves in one direction for the north track of each pair, the other direction for the south track.

Thus, the roofs move one way, the body the other, on the south pair of tracks until the two are joined and proceed together down the body track.

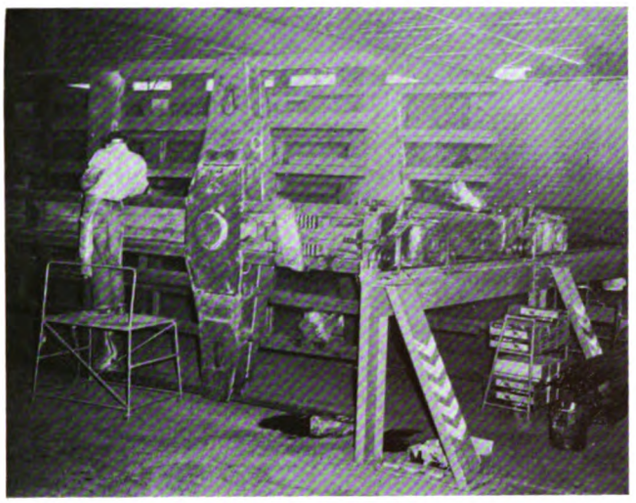
The same is true for the trucks and assembled car on the north pair of tracks served by the pulling system. A groove is provided in the floor to accommodate the cables so that they do not interfere with work alongside the tracks.

Pressure Heating System

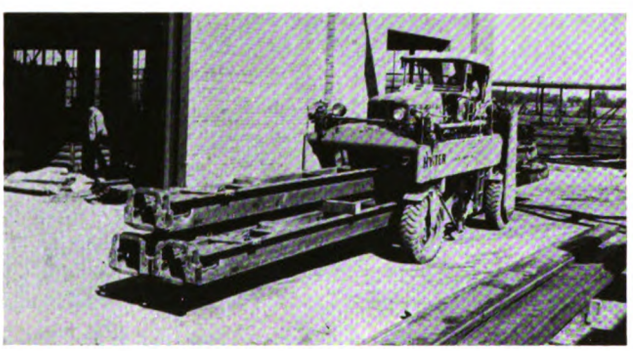
Heating in the main shop is combined with ventilation in a pressure-type system. The system incorporates fresh-air heaters, located four along each side wall. The fresh air heaters are equipped with fans and steam heating coils. They draw in fresh air through louvered intakes in the side walls, heat the air, then blow it out into the shop area through outlets located about 8 ft above the floor. The heated fresh air circulates throughout the shop area, thence is exhausted through gravity-type ventilation in the roof.

One of the strongest impressions a visitor receives is the unusually low noise level that prevails in this shop—particularly in the offices on both the upper and lower floor. The office and welfare addition to the main shop has concrete floors on both the first and second floors. The floor is laid over bar joists with corrugated iron forms. The floors on both levels are covered with asphalt tile. Room partitions are constructed of 2 by 4 studding, covered with rock lath and plaster. The exterior walls and ceilings are plastered over metal lath.

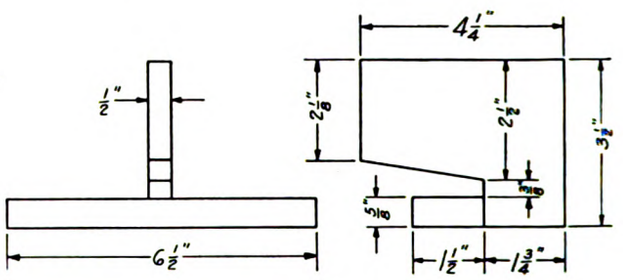
The shop area receives an abundance of natural illumination through horizontal projected-type windows and glass-block panels along the building walls. Windows are



In addition to permitting the underframe structure to revolve for downhand welding, the spinner also allows movement along the outer rails of the jig



During the day, many heavy parts are handled by trucks to avoid having to clear the working area below the crane during move



A wedge of special shape (as detailed above) is used to clamp the Nailable Steel Flooring tightly against the end sills and the four stringers for welding it in place

also located in the clerestory over the center bay. Artificial lighting is provided by both mercury-vapor and fluorescent lamps.

Lighting throughout the addition is furnished by suspended-type fluorescent fixtures. A fin-tube base-board system has been installed for heating the offices and welfare areas.

Power Supply

Power is brought to the shop area at 35,000 volts. The main transformer cuts this to 4,500 and breaks it up into major circuits (either one large building or several smaller ones). Within the freight car shop banks of transformers near the ceiling reduce the voltage to 440, 220 and 110. The 440-power runs all welding machines and motors; the 220 and 110-volt circuits are for lighting only.

Six lever switches inside the shop kill groups of transformers. Master switches within the 4,500-volt major branches kill the whole building, or circuit. There is also a master switch on the 35,000-volt intake line that cuts the power to all the car shop buildings as well as to the locomotive shops three miles away.

Both Builds and Repairs

The new shop is equally adaptable to the construction of new cars or to the repair of old cars—and to doing either class of work to any type freight car. Its first major program was the construction of 1,000 box cars at the rate of 12 a day. The cars in this program are of 50-ton capacity with an inside length of 40½ ft. The outside width and height are 10 ft 5 in. and 13 ft 11 in. Inside width and height are 9 ft 2 in. and 10½ ft. and the capacity 3,890 cu ft. Half the cars will have 15-ft doors and half will have 6-ft doors.

All the cars will have Ride Control trucks, hand-operated slack adjustors and reflective tape on the exterior. There will be 750 cars with waste-substitute boxes. 250 with waste and neoprene packing retainers. Over a half dozen different draft gears are being applied. both rubber and friction; in some cases both types by the same manufacturer are being installed. The first 200 cars are getting the new cast steel wheels, the remainder conventional one-wear steel wheels. All cars will have threshhold plates.

A new type of side and end lining—called Nuloc—is being tried on the first 500 cars. The next 500 will get plywood in extra large (10 ft 3½ in.) sheets, and all end lining will be 1½ in. tongue-and-groove. The Nuloc siding is made up of 3¼-in. boards glued together with a tongue on top and a groove on the bottom. The first five panels from the bottom are 3 boards thick (9¾ in.). The next four are five boards thick (16¼ in.). On top of this are two finishing boards to complete the side lining.

Each section of paneling is toe nailed to each post using 8-penny common nails. The side lining is also face nailed using one 2½-in. screw nail to each board on each side post. Screw nails are also used on the end board using one 3-in. long nail to secure each board to each filler. The perishable strip is likewise secured by 3-in. screw nails. This strip is also extra wide (7¾ in.) to avoid nailing into the lining.

Mekydro Torque Converter

(Continued from page 79)

Delivery to the Army was made in Washington, D. C., during celebration of Transportation Corp's 13th anniversary. The locomotive was then returned to Eddystone where it is now undergoing further test. This unit differs only slightly from the Baldwin-built diesel-electric used by the Army. It will operate multiple-unit with mechanical or electrical transmission units.

indicated that the Maybach unit was the best available transmission for road locomotive service which had been thoroughly tested."

This torque converter has a transmission efficiency about the same as the electrical transmission—a little over 80 per cent. A single hydraulic coupling by itself would not have this efficiency over a speed range required for railroad service. A completely mechanical gear transmission is not practical for high power output because there are great changes in engine speed and tractive effort when gears are being shifted which results in excessive slipping, heating and wearing of the clutch. This multi-speed mechanical hydraulic transmission overcomes the difficulties found in either the mechanical transmission or the hydraulic transmission alone. A high transmission efficiency is obtained over the entire speed range of the locomotive, and yet the tractive effort curve is an almost continuous smooth line.

The usual hydraulic coupling consists of a centrifugal impeller and turbine mounted in the same housing and both completely surrounded by transmission oil. There are two features which characterize the Maybach transmission. One is the use of a second set of turbine blades not connected to the output shaft which move in during periods of gear shifting and load the input impeller so that the engine speed and loading will not vary. The second Maybach development is the overrunning claw clutch which eliminates the usual wearing difficulties of standard clutches and permits the transmission of much greater power.

The four-speed gearing is automatically shifted by a flyball-type speed regulator that responds to the relative speeds of the locomotive and the engine. The clutch linkages are moved by oil pressure. Radiator water is used to cool the Dekydro unit. This torque converter is energized, de-energized and reversed by solenoids which permit multiple unit operation with either diesel-electric or diesel-mechanical units. In event of electrical trouble, motive is stopped.

The Mekydro, like the electrical drive, has practical lower and upper speed limits. The upper limit is governed by design of the rotating members. The lower limit—the continuous speed of the locomotive—is determined by the overheating of the oil in the torque converter. In its present state this unit cannot be adapted for dynamic braking. After Baldwin completes adjustments on the Army locomotive and conducts further tests with it, the 1281 will be placed in service by the Transportation Corps.

Concrete Boxes Speed Up Yard Servicing

Yard train delays caused by journal box oiling are reduced on the Frisco at St. Louis by a series of strategically located concrete storage bins for oil cans and jacking equipment. The bins are spaced every 250 ft, or five car lengths, along the outbound inspection track. They serve as a point for the oilers to exchange an empty can for a full one without stopping to refill.

The 250-ft spacing was chosen because the 2-gal cans hold enough oil for about five cars on one side. Thus, the oiler passes one of the boxes at just about the time that his oil can becomes empty. He leaves the empty can in the box and takes out a full one, oils the next five cars, repeats the exchange, and continues this procedure until all journal boxes have been oiled. The empty cans which were left in the bins are filled between trains.

The boxes are 2 ft wide, 2½ ft deep and 4 ft long. They hold ten oil cans, a journal jack, wheel iron and jacking blocks. A two-part steel cover is hinged in the center and is painted yellow for night visibility. The cans are filled from 8,000-gal tanks at each end of yard.

Continuous fluorescent lamps provide well-distributed illumination for 120 passengers on the head-end m-u cars and locomotive-hauled coaches.

Air Conditioned M-U and Locomotive-Hauled Coaches

Power from third rail drives, cools and heats Long Island m-u cars. Undercar power plants supply power for coaches used outside the electrified zone.

■ A total of 140 air-conditioned m-u cars and 80 locomotive-hauled coaches are now being built for the Long Island by the Pullman-Standard Car Manufacturing Company, at Worcester, Mass. The cars were purchased to replace obsolete cars and to meet the growing needs of increased traffic.

Existing cars which are to be retained in service are being equipped with greatly improved ventilation by means of circulating fans and new lighting which will produce illumination values of 25 footcandles on the 45 deg reading plane, 30 in. from the floor. Illumination values in all of the new cars will also be 25 footcandles.

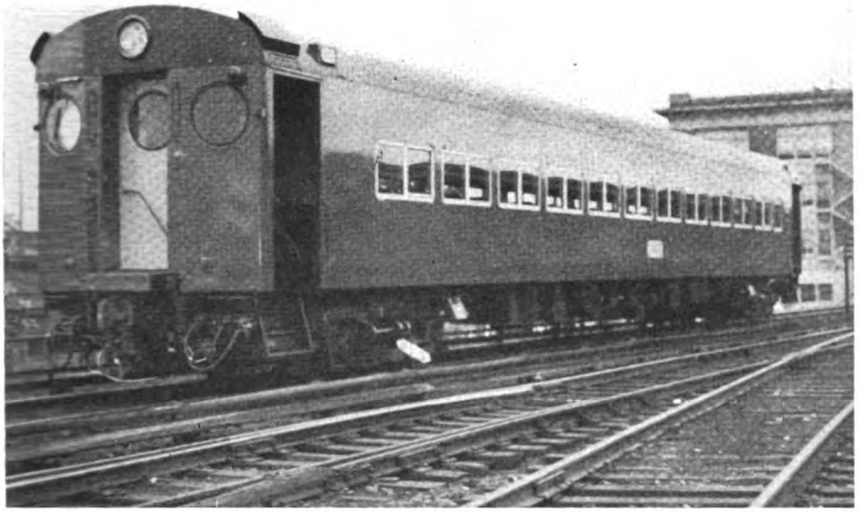
The new cars consist of 22 head-end motor cars, 74 motor cars without cab control equipment, 44 m-u trailers and the 80 locomotive-hauled coaches. All cars are essentially identical as to equipment and decoration. Head-end m-u and non-m-u coaches have a toilet at one end, and a seating capacity of 120. Other cars seat 123. All accessories such as seats, baggage racks, lighting fixtures and window curtains are identical and interchangeable regardless of manufacturer.

The car structure is a welded girder type design with plain painted sides, ends and roof. There are vestibules at each end and there are four sliding side doors and two sliding body end doors, except for the cab cars which have a swing type vestibule end door. For operation at high- and low-station platforms, there are four trap doors.

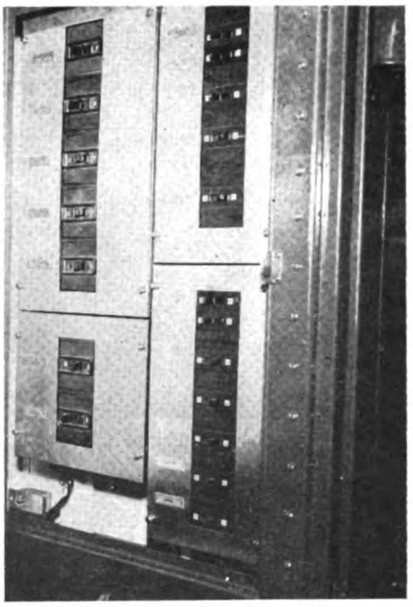
Glass fiber insulation, three inches thick, is used for insulating roof, sides and ends. Side windows are of the fixed unit frame assembly type of extruded aluminum with curtain guides.

Floors are made of composition material covered with 9 in. by 9 in. gray and marbleized black rubber tiles laid in checkerboard pattern. Seats are of the two- and three-passenger design and are reversible walk-over type with stainless steel trim and plastic arm rests. Upholstery is green vinyl covered plastic. Cushions and backs are hair and spring type, the cushions having foam rubber topping for added comfort. Interior finish on sides is stainless steel. Trim includes cadet blue enamel with Navajo red stripe, while ceilings are white. The outside of the car is done in dark gray with green roof and light gray letters and red numbers.

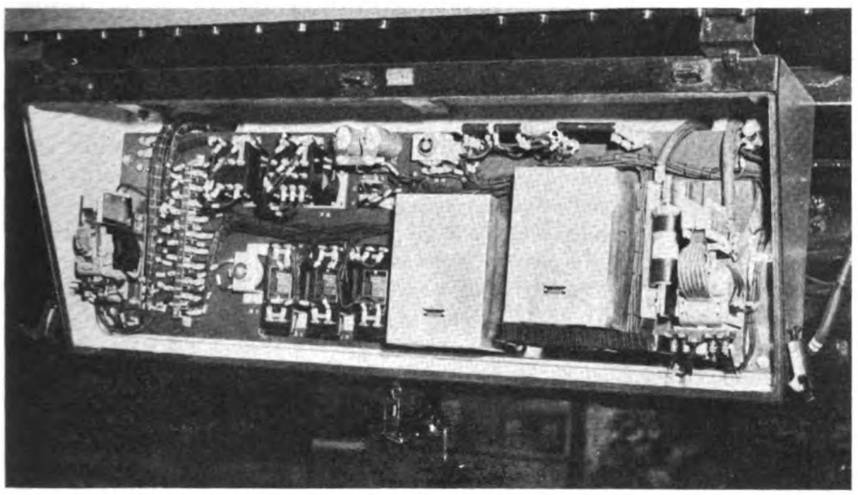
For m-u cars with cabs and motorized trailers, the trucks are of the cast steel, four-wheel, single equalizer, bar type, with helical equalizer springs and combination elliptic and helical bolster springs. They have an 8-ft



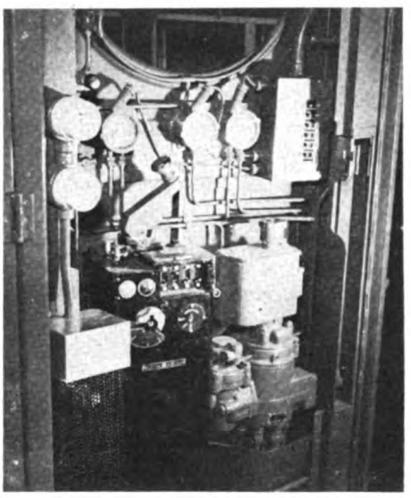
All 220 cars will have this same general exterior appearance. Shown is one of the 22 head-end motor cars, all of which will be equipped with automatic train control equipment.



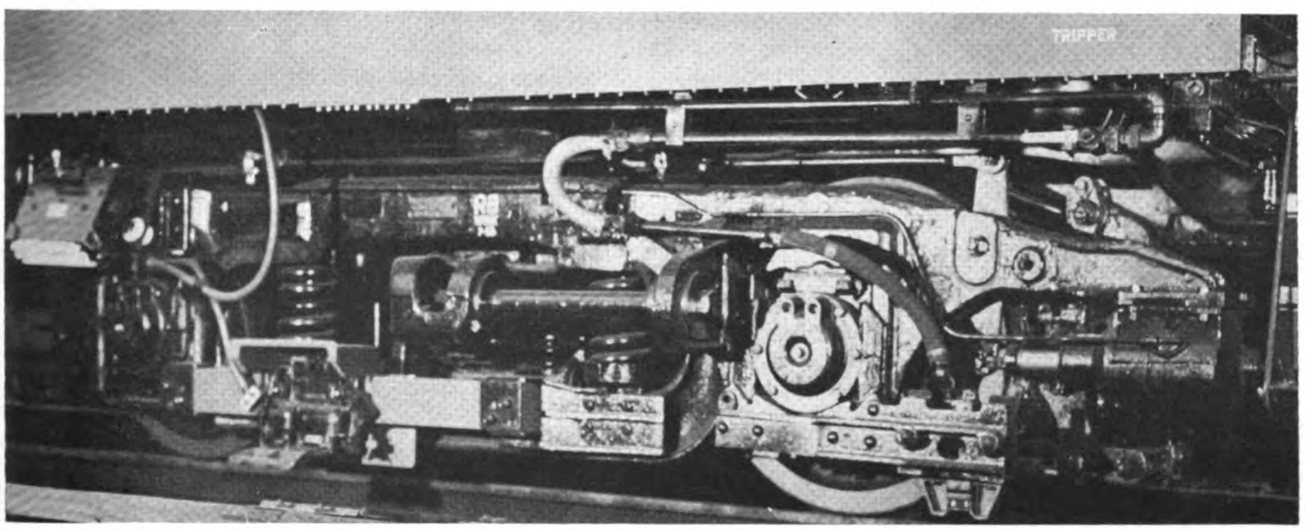
Panel on one of the car platforms controls the lighting, and auxiliaries.



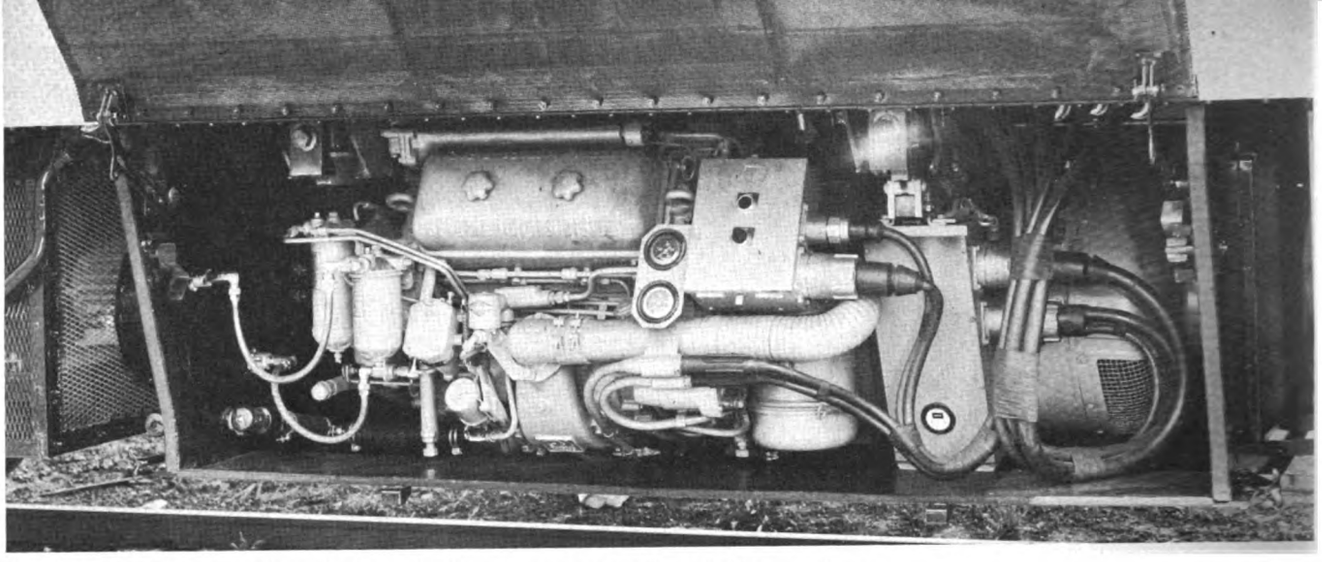
Motor generator set installed under the car is controlled by this cabinet. The 40-volt power generator is for traction control circuits, emergency lighting and battery charging.



Cab control equipment in one of the 22 head-end motor cars.



Trucks on the powered m-u cars have 8-ft wheel bases, are equipped with two 100-hp traction motors, and roll on 6- x 11-in Hyatt roller bearing journals.



Diesel power plants are used on the locomotive-hauled coaches. The General Motors undercar units supply power for the fluorescent lighting and the motor-driven air-conditioning compressor.

wheel base, and 6-in. by 11-in. journals for roller bearings.

The 100-hp, self-ventilated traction motors are transom-hung with one motor geared to each axle with single reduction gearing and flexible couplings. All trucks without motors have an 8-ft 6-in. wheel base, and 5½ in. by 10 in. Hyatt roller journal bearings.

Brakes are designed in accordance with the Westinghouse Air Brake Company's schedule D-22-P for passenger car brake equipment, with D-22-AR control valve.

Cab cars only are equipped with Union Switch and Signal Company's three-indication, Type EL, two-speed, automatic speed control system.

Traction Motors and Control

Electrical equipment for car propulsion is supplied both by the General Electric Company and the Westinghouse Electric Corporation. The four traction motors on each motor car receive power at 600 volts (nominal) from the third rail. Two motors are connected permanently in series with 300 volts on each motor. With a train of normal consist, an acceleration rate of 1.00 mphps is obtained. Cars will operate in combination, having as few as 60 per cent motor cars and 40 per cent trail cars. Motors must operate on voltages which may vary from 725 to 400.

Motors have one stage of field shunting and the controller has 11 contact units for cutting out accelerating resistance. An acceleration relay limits the rate at which the motors can accelerate to a predetermined value.

Power for motor-car control circuits, and vestibule and emergency lights is obtained from a 600/40-volt m-g set and a 16-cell, 300-amp-hr lead-acid battery.

Lighting and Air Conditioning

General interior illumination is produced by continuous ceiling-type fixtures, each unit being equipped with two 40-watt, 115-volt fluorescent lamps. Power for their operation is obtained from motor-alternator sets. Vestibule, emergency, and marker lights are incandescent.

Headlights consist of twin, sealed-beam lamps operating from the battery charging voltage, with a resistance in series with the lamp.

All cars are air conditioned by a Frigidaire eight-ton system. It includes a motor-driven four-cylinder freon compressor, an air-cooled condenser unit having a total surface of 960 sq ft, with receiver, fan and motor unit, and a split evaporator with a surface of 560 sq ft. The evaporator blower motor is rated 1.5 hp and delivers 2,400 cfm of air.

Cooled air is distributed by Safety Car Heating and Lighting Company's ceiling-mounted air distributor and is delivered through a center ceiling duct.

Refrigerant compressors on m-u motor cars and trailers employ 600-volt d-c motors, while those on the locomotive hauled trailers are 3-phase, 60-cycle, a-c motors.

There is a recirculating grille in the lowered ceiling near the evaporator and there is a 1,000 cfm, motor-driven, exhaust-blower at the opposite end. Three points of cooling are provided.

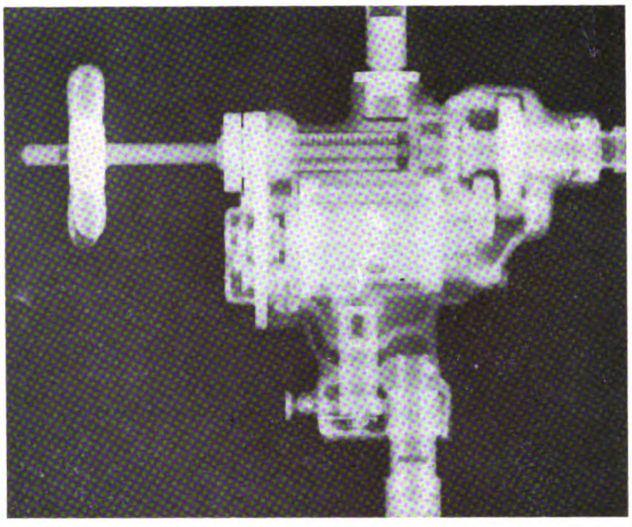
Frigidaire undercar power plants supply electric power to the locomotive-hauled coaches. They consist of a 3-cylinder, 2-cycle diesel-engine driving a 25-kw, 220-volt, 60-cycle, 3-phase, 1,200 rpm alternator and a 38-volt, 50-amp, d-c battery charging generator.

Heating

The m-u cars and m-u-car trailers are electrically heated by means of 30 kw of floor heat and 22 kw of overhead heat. The equipment, supplied by the Railway Utility Company, consists of heating units mounted along the side wainscot, and in the air-circulating system. There is also a cab heater, a windshield defroster and additional heat in the toilets. Controls provide for holding inside temperatures at 71, 73 or 75 deg F. Heating and cooling controls are interlocked so they cannot be operated simultaneously.

Locomotive-hauled coaches are heated by the Vapor Heating Corporation's Unizone steam heating system.

Radioactive capsule holder resting in a cavity on top of the extended piston rod. Lead cover for air lift hole shown in foreground and lead blocks for the protection of operating personnel, in the background.



Demonstration radiograph made at the Sacramento research laboratory of the Southern Pacific, showing how the various intricate inner parts of an air motor fit together. Radiographs have been particularly valuable in showing the interior assemblage of oil filters,—which can be determined in no other way.

On the Southern Pacific

Gamma Ray Radiography

Is Used Without Hazard to Operators

■ Southern Pacific has been able to increase six-fold the power of an atomic-radiation testing device used in its Sacramento laboratory, thanks to a special airlift devised by the railroad's technicians, according to an announcement by J. W. Corbett, vice president in charge of operations.

Under remote control, the airlift—a small pneumatic elevator designed and perfected at the laboratory—brings radioactive material up from underground storage to expose vital metal parts and tools to the penetrating gamma rays. After the rays have detected flaws deep inside the metal and have recorded them on sensitized film, much as X-ray pictures are recorded, the airlift returns the material underground. Technicians can then work within a few feet of the stored radioactive material, day after day, completely protected from it by the earth and by a lead cover over the airlift hole.

The Sacramento installation has been inspected and praised for its safety by representatives of the United States Atomic Energy Commission.

The radioactive material used is known as cobalt 60, a product of the atomic pile operated by the Atomic Energy Commission. The process of employing cobalt 60 to detect and record subsurface flaws is known as gamma ray radiography. This process also is useful to the railroad in revealing interior fitting of various complicated parts of enclosed objects such as filters and motors.

Although only a tiny piece of cobalt 60 is used, occupying a small part of a capsule which is only about 3/8 in. in diameter and 3/4 in. long, the rays it emits are so powerful that they have been used in the Sacramento Research Department of the railroad to radiograph the interior of steel objects as much as 12 in. thick, exposed for 16 hours at a distance of several feet from the radioactive capsule. Some exposures require only a few minutes. Power of the cobalt 60 is comparable to a two-million-volt X-ray machine.

The objects radiographed are in no way made radioactive by the cobalt 60, it is pointed out by P. V. Garin, engineer of research and mechanical standards for the railroad, and the objects can therefore be handled as soon as the exposure is ended and the cobalt 60 is again underground.

All precautions as required by strict federal and state laws are rigidly followed to provide safety for personnel assigned to this work, according to B. F. Kline, chief chemist in direct charge of the laboratory, and John C. Bristow, the railroad's radiographer. Only persons who have been approved by the Atomic Energy Commission may use such radioactive isotopes as cobalt 60.

Cobalt 60 is what is known as an artificially radioactive element, created from ordinary cobalt 59 metal irradiated by neutrons in an atomic pile. As a result of the irradiation, some of the cobalt 59 is transmuted into Coblat 60 which emits gamma rays.

Cobalt 60 is described as the successor to radium, costing about 1/44 as much. However, it has a much shorter life, its power decreasing by about one half every 5.3 years. Early applications of Cobalt 60, made by the Southern Pacific, were described in the September 15, 1952 issue of *Railway Age*.

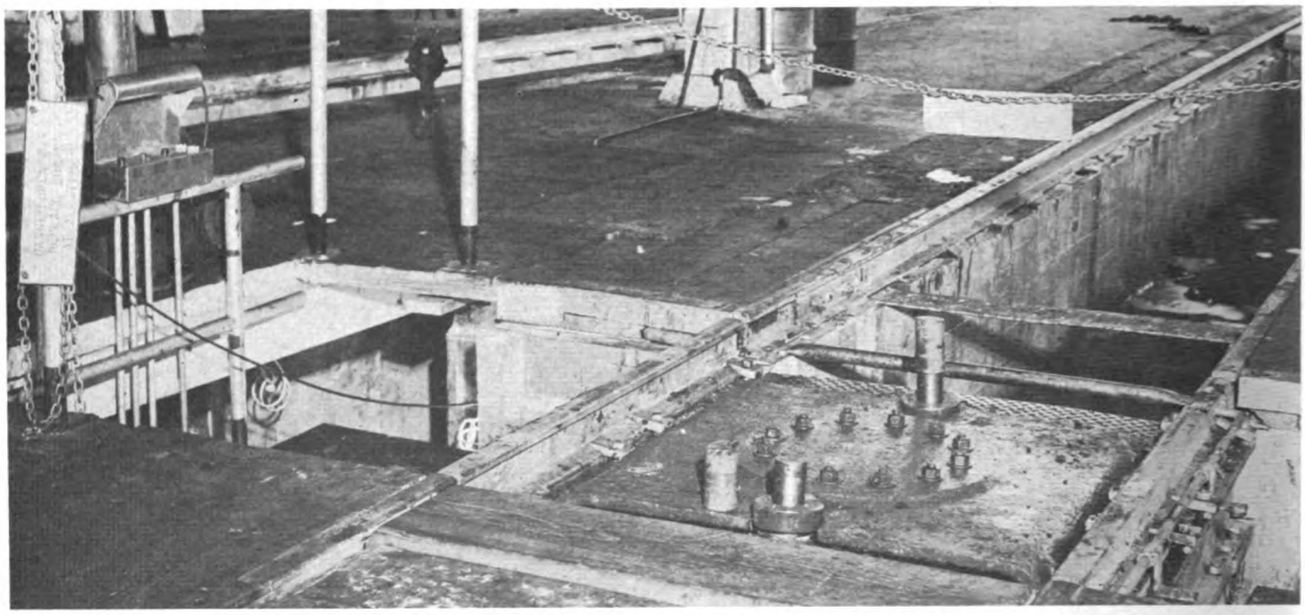


Fig. 1—A general view of the narrow table with a dropped working platform on either side.

Roundhouse Drop Pit Adapted to Diesel Needs

Union Pacific produces a good facility for dropping wheels and a motor by shortening the table and adding controls

■ A roundhouse drop pit is not a good device for dropping a pair of wheels and a motor from a diesel-electric locomotive. The reason is that the pit which was made wide enough to drop a large driver is too wide for the diesel. When a diesel is placed over such a pit, the jack for supporting the body when the wheels are removed is too far from the center of the table. Although the jack is placed as close as possible to the edge of the pit, the diesel drivers will rest on one end of the table. This will cause the hydraulic hoist to bind when it is used to take the weight of the motors and wheels.

To overcome this difficulty, operators in the Union Pacific shop narrowed the pit, and made the table correspondingly shorter. This allowed the jacks to be placed close enough to the center of the table so that the weight of the wheels and motor to be removed, is balanced on the table.

Before the motor can be removed, it is necessary to remove the nose suspension springs. To provide for this, the table is equipped with two small hydraulic cylinders or rams on each end of the table which operate push

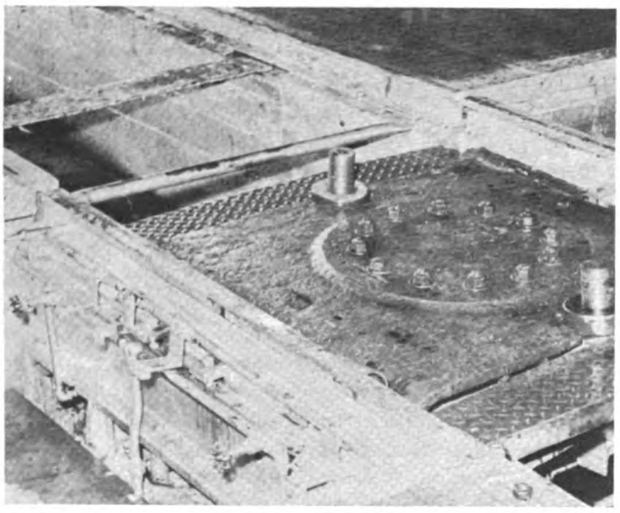


Fig. 2—The two rams raise one motor nose or the other. The valves at the side control flow of oil to the rams.

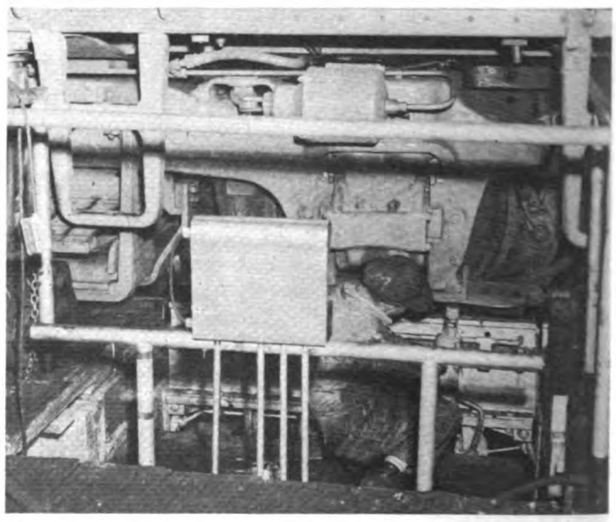


Fig. 3—Unit on drop pit and workman on lowered platform using impact wrench.

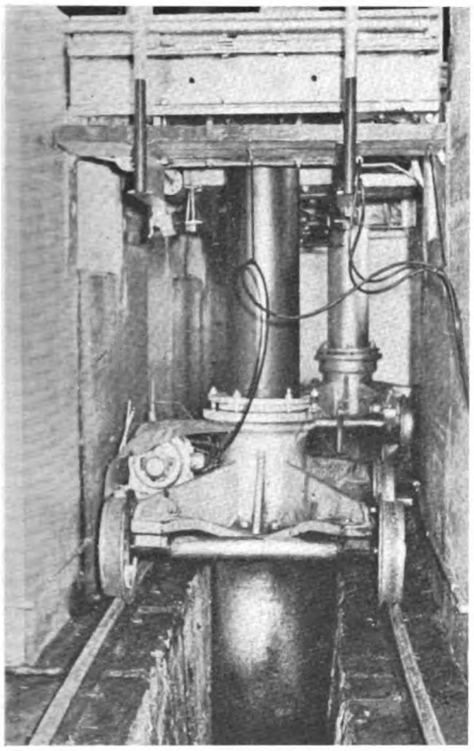


Fig. 4—Motor-driven trucks with hydraulic pistons for lifting tables.

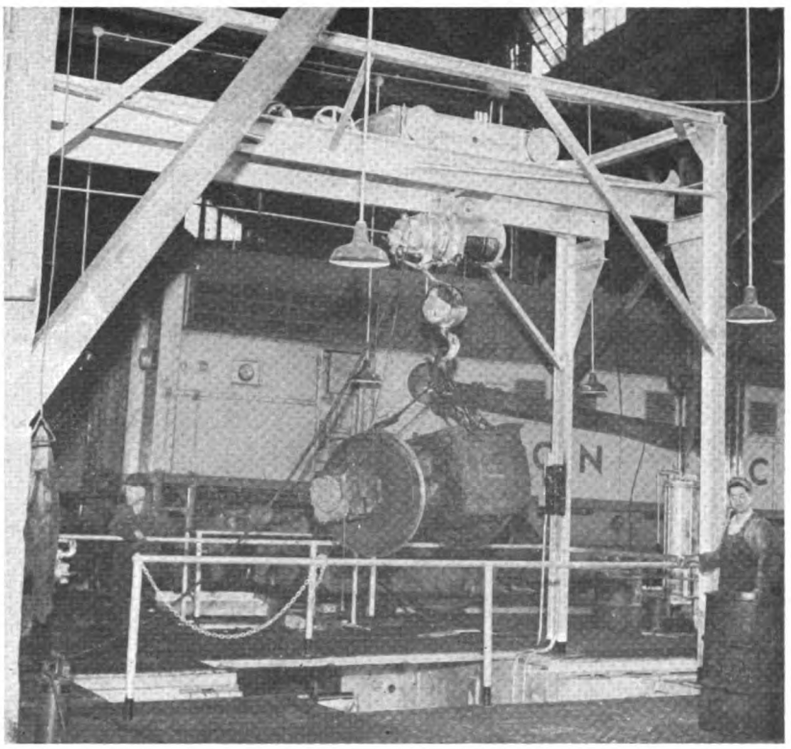


Fig. 5—An electric hoist is used to remove wheels and motors from an adjacent track.

rods, as shown in Figs. 1 and 2. One or the other of these rods, depending on which motor is being removed, is used to lift the weight of the nose of the motor, while the springs are taken out.

The valves at the left in Fig. 2 are used to select which one of the rods that is to be raised, and when both valves are closed, the rods will remain in any position to which they have been raised. It will also be noticed in Figs. 1, 2 and 3 that there is a lowered working platform at each side of the table to allow for convenient use of a torque wrench.

Pushbutton controls for the table are placed at one end of the pit, as shown at the left in Fig. 1. The first button at the left raises the table, the second lowers it, the third operates the ram which is to raise the motor nose, and the two at the right control the travel of the table in either direction from one track to another.

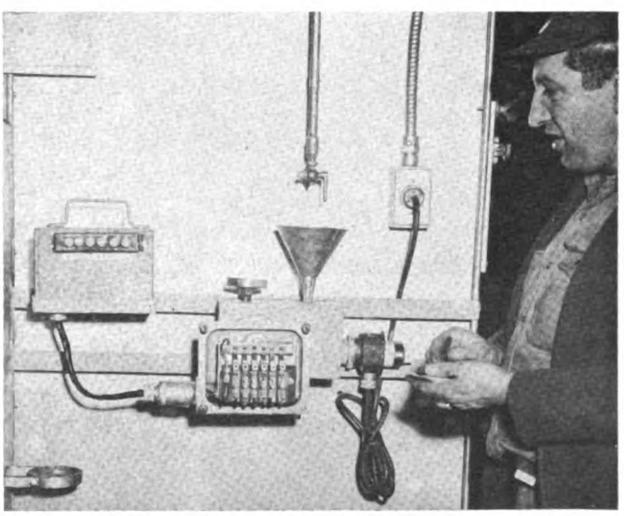
After a pair of wheels and a motor are removed, they are dropped down into the pit and moved to the adjacent roundhouse track by the motor-driven truck, shown in Fig. 4. When delivered to the next track, they are picked up by the motor-driven hoist shown in Fig. 5.

Vernatherm Tester

■ The equipment shown in the illustration was made in the Glenwood, Pa., shops of the Baltimore & Ohio for testing of Vernatherm temperature controls used on Electro-Motive diesel locomotives. The funnel is in the filling hole of a small tank full of water. Also in the tank is a dial-type thermometer, shown at the left. In the bottom, and connected at the right, is an immersion heater.

Mounted on the front of the tank so that its contacts are controlled by the heat of the water is the Vernatherm under test. Closing of Vernatherm contacts will operate corresponding lights in the box at the left and a little above the tank.

The test consists of first setting the Vernatherm contactor gaps as prescribed by the manufacturer of Vernatherm. Then the water temperature is increased until each contact closes and lights one of the indicating lights. The water temperature is observed as each light comes on and minor adjustments of the contact gaps are made until each one operates at its prescribed temperature.



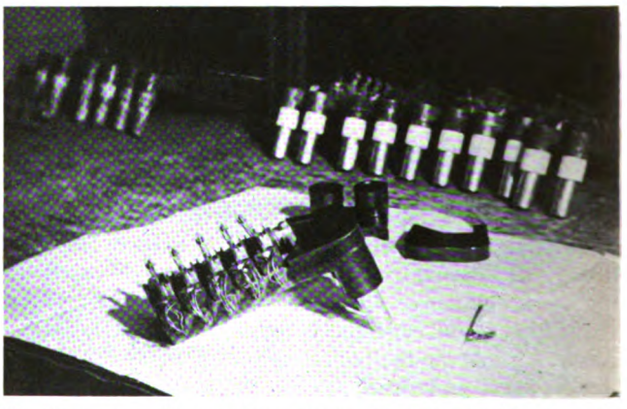
The temperature at which each contact closes is measured.

The boot is installed by slipping the bottom section up over the two insulated supports, then . . .

The cover is applied to the top and the two cemented together by a special sealer

Flashovers—How The North Western

When flashovers like this are avoided, damage to brushholders and insulators is negligible



The boot comes in two sizes, one to fit over porcelain pins, the other to fit the newer polyester and plastic pins

Has Almost Completely Eliminated Them

BY L. E. LEGG,
Electrical Engineer, C&NW

Certain things we do or don't do are definitely known to affect the frequency of occurrence and the intensity of flashovers. With all the maintenance precautions taken, flashovers still persist as one of the most costly items of maintenance. One railroad of average size spent over $5,000 in a single year for material alone to replace the porcelain brush holder insulators shattered in flashovers. Adding the labor to replace them and allowing for the train delays would no doubt triple this cost.

One primary reason certain main generators flashover so readily is insufficient clearance between the brush holder and the frame of the generator. Increasing the air gap would be the proper manner of rectifying such difficulty, but this would involve substantial changes in design and is impractical on existing equipment. The next best manner would be to effect as near as possible the equivalent of an increase in the air gap.

This has been done in the development of a neoprene

boot is simply a barrier which, through its insulating qualities, provides the equivalent of greater clearance between the brush holder and the frame of the generator. It opposes the free flow of current between the brush holder and the frame of the machine and the return of the current to a brush holder of opposite polarity under ionization. Here is what it has accomplished on the North Western.

On Aug. 1, 1953 16 F-3 and F-7 units were equipped with the neoprene boots. The 16 units selected for the test were those which had been the worst flashover offenders of the freight fleet. During this initial test of four months these 16 units accumulated 600,000 miles and not one porcelain or brush holder was damaged. In two instances slight "spattering" in the vicinity of the risers was observed which indicated that flashover current was arrested before reaching damaging proportions. The only other adverse observation was that the original neoprene boot was inclined to become impregnated with carbon dust and thereby cause slight grounding of the brush holder to the boot. While this caused no difficulty as no difference of potential exists between the two, this condition was corrected by glazing the boot with a high dielectric material.

C&NW To Equip All Units

So improved was the operation of these sixteen locomotives that the management decided to equip another 100 units for further test, the results of which were given on Nov. 19, 1954. During the years' operation of these 100 units there was no damage to porcelain or brush holders. As before, the most severe evidence of flashover was limited to slight "spattering" about the risers, and this occurred in only three instances.

Of the 591 units not equipped with the boots 7.44 per cent flashed over costing more than $12,000 for the year in labor and material. Of the 100 units equipped with boots, 3 per cent showed slight "spattering" and the cost was negligible. As a result of these tests—covering 11¼ million unit miles of operation, the C&NW is equipping all units to which the boot is applicable.

Experience in two different cases has further substantiated the effectiveness of this simple device. The first was when only eight boots were applied to a generator having twelve brush holders. When a severe flashover occurred, the four unprotected brush holders were damaged beyond further use while the eight having boots were not touched by the flash.

In the second case a three-unit locomotive pulling a heavy freight flashed over due to the No. 8 and 9 wire inside a control jumper breaking. As the defective control jumper was between the first and second units, it permitted the power contactors on the two trailing units to drop out under load when it broke. The power contactors were badly burned. The generator in each of the trailing units was subjected to the same abuse, and each one flashed over. One of the trailing units was equipped with boots and the other one was not. The one without boots received heavy damage to the brush holders as well as to the armature. The one with boots received only slight "spattering" as had been the experience in the few cases theretofore.

By the engine crew. It manifests itself in the form of small copper beads on the copper surfaces and is usually found by the electrician on inspection after the run. This is referred to as "spatter." Other flashovers are sometimes so violent that brush holders are completely burned in two and armatures damaged beyond further use. Once the arc is struck and the current starts to flow or stray it sometimes increases to short circuit proportions before the ground relay has had sufficient time to trip and cut off the field excitation. Damage can occur between the time the ground relay trips and the field collapses.

The neoprene boot (made by the Equipment Research Corporation) seems to be the likely remedy for the flashovers which cannot otherwise be traced, such as a grounded armature coil, an eccentric commutator, defects in the external circuit, etc. A flashover is still almost certain to result if an armature coil suddenly develops a solid ground which permits heavy current flow into the lamination and thereby unbalances the electrical equilibrium. No known device will prevent the flashover from this cause. Fortunately, however, such cases are extremely rare. For most flashovers, the neoprene boot is nearly 100 per cent effective. There has never been a known instance in which this neoprene boot permitted the flow of current between the brush holder and the frame of the machine, or from one brush holder to another. Nor has there been a single known instance of a damaged porcelain insulator.

Photoelectric Flashover Protection

To the Editor:

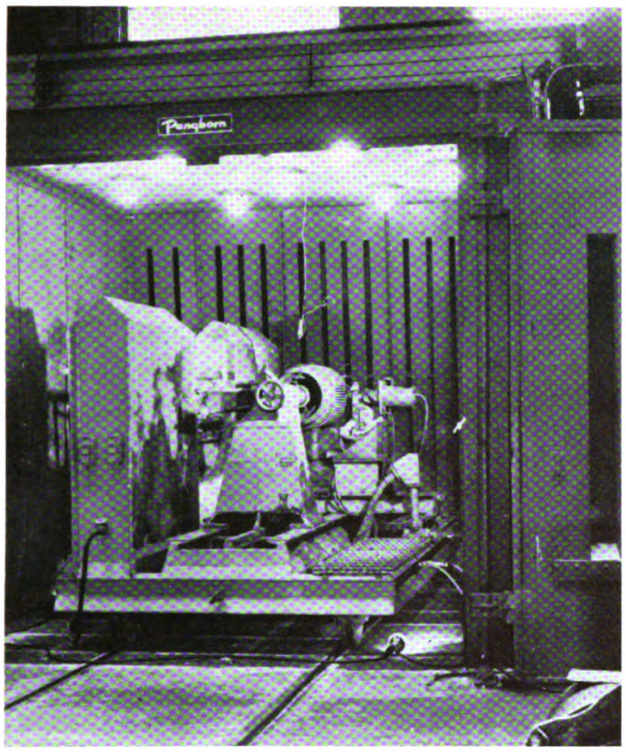
I read with great interest your article by W. A. Kirsch, on flashover protection.

Daily, I see destructive damage due to flashovers on our locomotives. Some of the flashover damage could be called severe, but most of them are limited to end bar and brushholder pittings. Brush and spring pigtails are very vulnerable to the milder form of flashover or excessive sparking. The outside edges of the commutator segments and brushholder faces show very clearly that much ring fire is being carried under certain operating conditions. There is little or no visible evidence of traction motor damage in most cases of this kind. I feel that the impulse relay will be effective in preventing or limiting the damage due to flashover caused by extreme current stress, but that more could be done to forestall lesser or milder forms of main generator ring fire or flashovers.

I believe that a photocell with scanner properly filtered, and placed to scan the commutator between brushholders would pick up and activate a relay similar to the one Mr. Kirsch described. To have a more complete flashover control, this could be used in combination with the impulse circuit described.

I would appreciate the opinion of others as to the merits of this idea.

John W. Brown



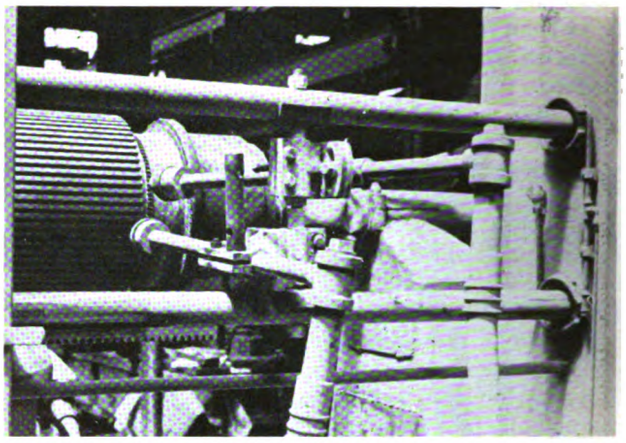
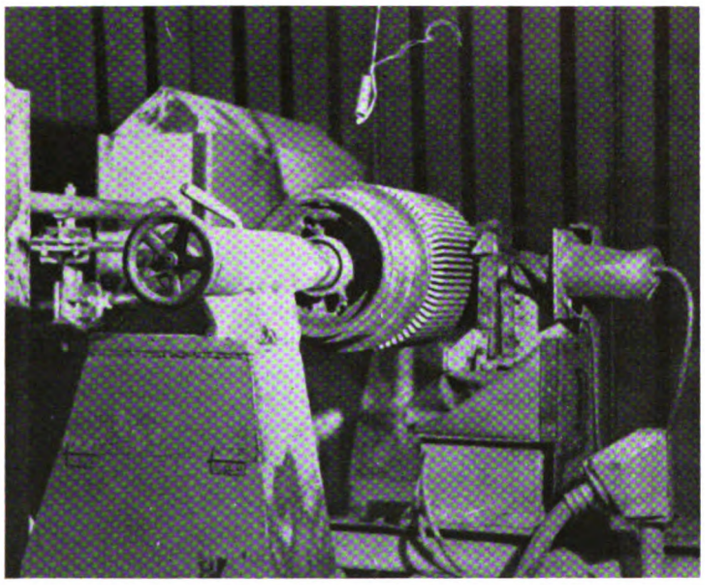


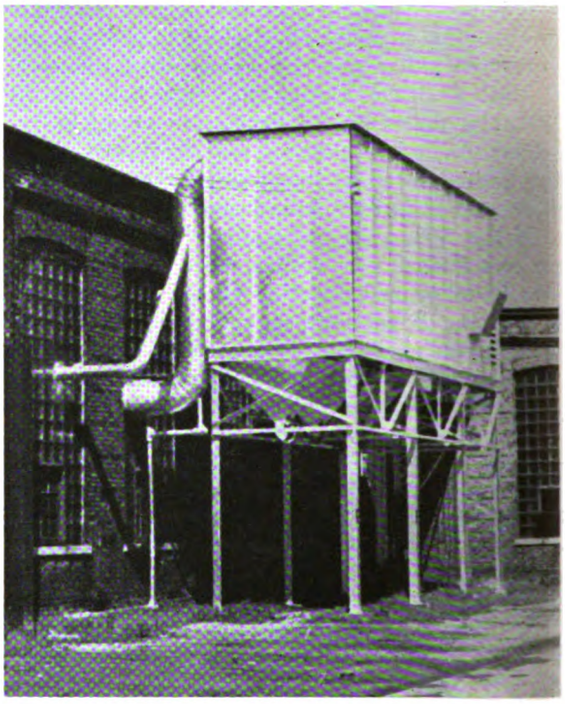
Fig. 1 (at left)—A core on the cleaning machine ready for the closing of the booth doors.

Fig. 2 (above)—The two cleaning nozzles mounted on the traversing mechanism.

Fig. 3 (lower left)—The ratchet at the right rotates the core one slot after each back and forth movement of the cleaning nozzles.

Fig. 4 (below)—The sand classifier which separates worn-out sand from that which can be used again.





Sand Blast Cleaning of Armature Cores

Rock Island works out procedure which does good work automatically without injury to laminations

■ The Rock Island electric shop now sand-blast cleans all of its traction motor armature cores which are to be rewound. The work is done in a Pangborn blast cleaning machine which has been adapted to the particular requirements of diesel traction motor armatures.

The core to be cleaned is mounted on a carriage which can be rolled in and out of the cleaning booth. This makes it possible to mount the core on the spindle of the machine outside the booth where a hoist is available. The machine in position for cleaning is shown in Fig. 1. Doors of the booth are closed during the operation.

The cleaning is done by two air-sand nozzles as shown in Fig. 2. They are inclined to each other so that sides and bottom of slots are exposed to the jet. For each slot, the nozzles are traversed from one end of each slot to the other, and back. The drive in the control box is transmitted to the nozzle traverse by the rack shown in the lower lefthand corner of Fig. 2.

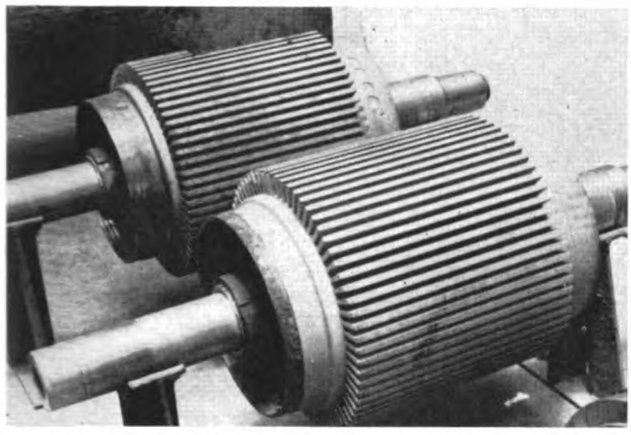


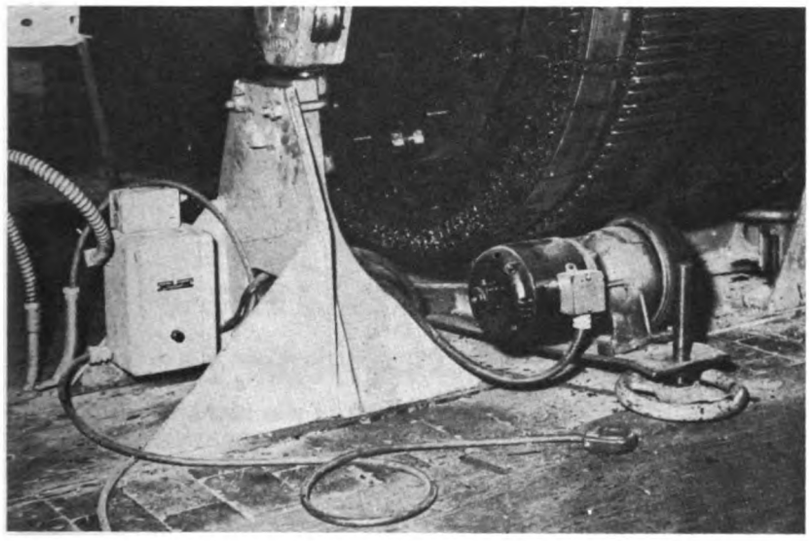
Fig. 5—A pair of cleaned cores ready for rewinding.

After each back and forth movement of the nozzles, the armature is turned one slot by means of the ratchet mechanism shown at the right in Fig. 3. Once set in operation, the machine continues to clean until the core has made one complete revolution, when it stops automatically. The control mechanism located in the cabinet at the left in Fig. 1, can be set for any length of slot, and any number of slots. The speed of operation may also be controlled.

The time of operation depends principally upon the length and number of slots. The average time on a traction motor core with 70 slots is about 35 minutes.

A fine grade of sand is used. The nozzle distance from the slots, and the amount of air pressure required was determined by varying these two factors until there was no peening of lamination edges, and no forcing of sand particles between laminations. This is accomplished by measuring the length of the lamination stack before and after cleaning. If there is any increase of length, it means that the nozzle distance must be increased or pressure reduced. Air pressure at the nozzles is controlled by a reducing valve.

Sand used in the booth is passed to the classifier shown in Fig. 4, which is located outside the shop, adjacent to the booth. Sand which has become too fine to do effective cleaning drops to the hoppers at the bottom of the classifier, and sand which is still sharp is returned to the pressure tank from which it flows to the cleaning nozzles.



Above: Armature drive and foot switch control.
At right: With his toe on the foot switch, the operator can always have his work in the most convenient position.

Armature Rotating Device

■ The work of overhauling generator armatures in the San Bernardino, Cal., shops of the Santa Fe, has been aided materially by a foot-switch-controlled drive for rotating the armature on its stand. It is used for applying string bands, for removing burrs and cleaning commutators and for general armature repair work.

The armature is mounted on a Peerless armature stand and is turned by a shop-made device which applies torque to the armature through a rubber tire which bears against the armature. The device consists of a ¾-hp. motor with a foot-switch control, driving a 10-in. rubber tired wheel through a 40 to 1 gear reduction. It is mounted on a steel plate which is hinged to the floor at one end under the armature. The outer end of the plate is supported by a threaded rod. The rod may be turned by a small handwheel to apply pressure between the rubber tire and the armature. The drive will rotate the armature at about 8 rpm.

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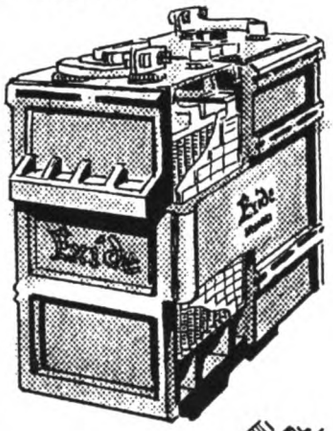

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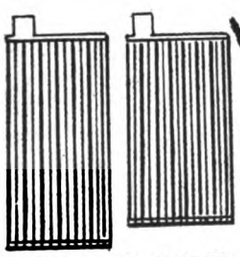

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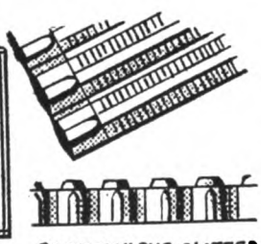

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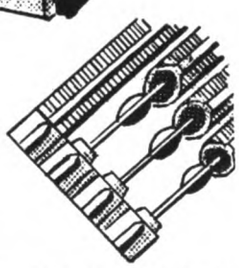

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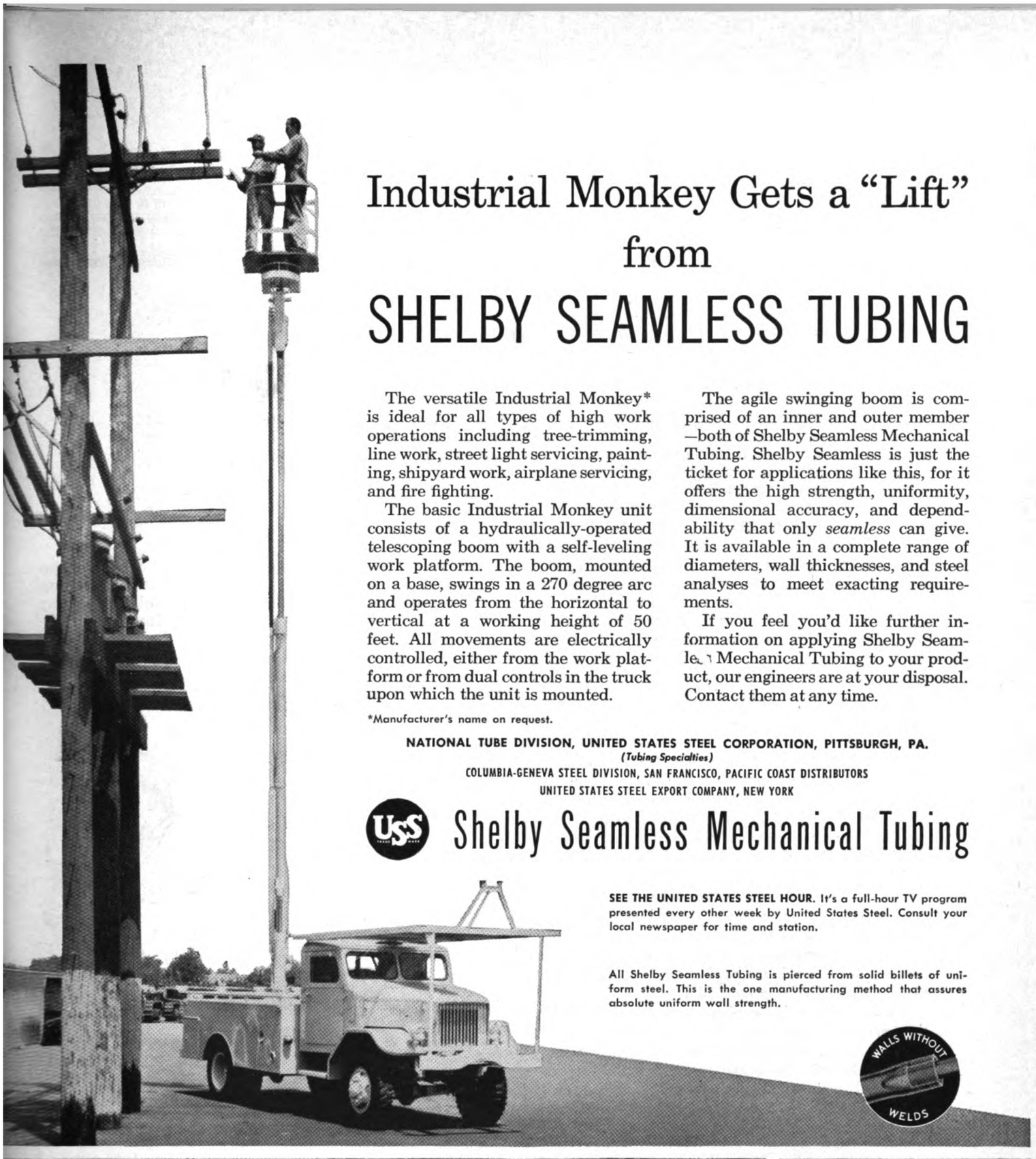

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The agile swinging boom is comprised of an inner and outer member —both of Shelby Seamless Mechanical Tubing. Shelby Seamless is just the ticket for applications like this, for it offers the high strength, uniformity, dimensional accuracy, and dependability that only *seamless* can give. It is available in a complete range of diameters, wall thicknesses, and steel analyses to meet exacting requirements.

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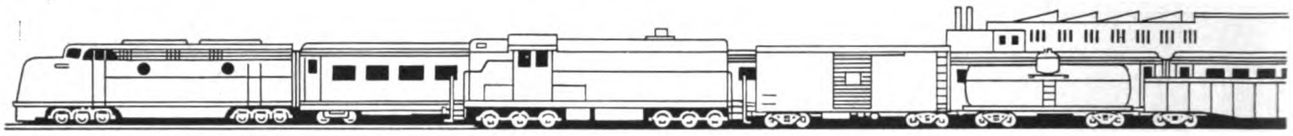

● **PROGRESS REPORT:** Your roundtable has really gotten around. It's not named yet, but we have had many suggestions. Massachusetts, Minnesota and Mexico have all been heard from (but not Texas!). Railroaders on the Illinois Central, the Reading, the Southern, the Southern Pacific, the New Haven, the Missouri Pacific, and many more have made suggestions. When everyone has had a chance to offer a name, we'll let you vote on them to pick the name that best identifies your new department. The coupon is again printed at the bottom of the page this month in case you haven't yet submitted your name. It must reach us by September 23. Don't forget that we will pay $25.00 for the name that is finally selected. More important, don't forget that since this is your department, questions and discussions about locomotive and car problems should come from you. To be answered next month: During the rebuilding of older diesel units, is the most economical solution complete rewiring? When it is used is this the thing that keeps the unit in the shop the longest, and if it is, how can this time be reduced?

Is there a solution to the problem of flat spots that develop on the wheels of diesel switchers?

(Last month a short discussion of this topic was prepared by the L&C staff. Most of the suggestions called for major changes, or the addition of more equipment to the locomotive. This month we have discussions which suggest that there can be times when there is not too much wrong with the locomotive as it comes from the builder—Editor.)

CHECK LOCOMOTIVE BRAKE EQUIPMENT *by O. L. Tomlinson, Machinist, Southern, Atlanta, Ga.* Good maintenance and proper attention can eliminate some wheel sliding. Assuming that the independent brake valve is the self-lapping type, there are two points to check. Accuracy of the brake cylinder gauge determines the precision with which the brake valve can be handled. If the pressure adjustment of the brake valve is set above the maximum tension of its pressure regulating spring, the excess pressure can remain in the brake cylinders with the brake valve in running position. If the adjustment is below that obtained with maximum spring tension, the brakes will then apply and release normally.

When brake cylinder piston travel is excessive, or if the packing leathers and piston rod felts are dry, then the release can be too slow to avoid sliding wheels. Pins and bushings in the brake rigging should be properly lubricated so they will offer no resistance to quick brake action. Finally, the hand brake should always be completely released.

RAIL CONDITION IS IMPORTANT *by E. C. Fowler, Locomotive Fireman, Southern Pacific, Los Angeles.* Rail conditions can be the cause of many flat spots. The writer calls attention to oil deposited on the head of the rail of many yard tracks. He says that this oil comes from car wheels. It is thrown there from the journal box because of the poor seal at the back of the box. Improved seals would help correct this situation, and would prevent some sliding.

Careless handling, and the improper use of the sanders can also result in flat spots. Proper maintenance of wheels, brakes and sanding equipment are important.

Have any special tools been developed for installing the newly-developed journal lubricating devices, can the regular packing hook be of any use, or is this strictly a hand operation?
[Not a solution, but another way of showing the complications that can arise from an unfamiliar device prompted the cartoon below—Editor.]

Q & A EDITOR Railway Locomotives & Cars
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Questions and Answers

Interchange Rules

This is the eighteenth installment of a series of questions and answers on the Association of American Railroads Code of Rules Governing the Condition of, and Repairs to, Freight and Passenger Cars for the Interchange of Traffic which may help car men clarify their understanding of the philosophy, intent and requirements of the Interchange Rules. The answers given to the questions are not to be considered interpretations of the rules of Interchange, which can only be rendered by the Arbitration Committee acting officially. The comments, however, come from a background of intimate association with the application of the rules. Obviously, comments or opinions as of today, may be inapplicable after a revision of the rules or further interpretations by the Arbitration Committee.

188-Q—Since the so-called "Piggy-Back" movement has been expanded on cars operating in interchange service, can advice be furnished at this time as to responsibility for charges for repairs to cars or damage to loading devices and equipment on flat cars equipped for highway truck trailer service?

A—The appropriate Committees of the A.A.R. now have this general subject under consideration, but in the meantime the following may be observed:

(a) In the absence of special agreements to the contrary, charge for repairs to special loading devices and equipment should be on the basis of Rule 105 for material and actual time at the A.A.R. rate for labor.

(b) Car owner is responsible for damage to car proper and damage to loading device and equipment resulting from failure of loading device and equipment or from loading or unloading of trailer, when not associated with any Rule 32 condition.

(c) Until such time as there are more of these cars built and the A.A.R. Committee has an opportunity to make studies and determine actual costs of construction, settlement under Rule 112 for cars so equipped would be on weight basis at pound prices applicable to flat cars.

189-Q—What is the proper labor charge for renewal of Barber Stabilizer friction castings?

A—Labor charge for application of Barber Stabilizer friction castings to Barber Stabilized Freight Car Truck should be on the basis of Item 156 of Rule 107.

190-Q—Is there any minimum requirement as to Brinell hardness for A.A.R. Alternate Standard tubular axle?

A—Yes. When the Brinell hardness of A.A.R. Alternate Standard tubular axle is reduced below the minimum of 227 because of overheating, its efficiency as pertaining to breakage is reduced and therefore the Interchange Rules now provide that in such cases axles with Brinell hardness so reduced may be scrapped at the expense of car owner.

191-Q—In handling refrigerator cars having underslung heater boxes on and off car ferries or floats at tidewater locations, why is it important to observe whether tide conditions are low or high?

A—Because under extremely low or extremely high tide conditions a situation can exist wherein there may be no clearance between the underslung heater boxes on such cars and the apron or other parts of the ferry or float. Under the provisions of new Interpretation No. 10 to Rule 32, the handling line is responsible for damage from such causes where it has definite knowledge that same occurred in this manner, unless construction of car violates the A.A.R. Clearance Diagram.

192-Q—Where charge is made for the application of coupler shim by tack welding per Item 178 of Rule 107, is additional labor charge permissible for R. & R. of carrier iron or coupler?

A—Coupler shim applied per Figure 1 of Rule 20 should be charged on tack welding basis, per Item 178 of Rule 107. No additional charge is permissible for coupler or carrier iron R. & R., nor for jacking.

193-Q—Is it permissible to stencil air brake markings on the side of refrigerator cars immediately above the reservoir location or as close thereto as possible instead of on the reservoir itself, in the interest of eliminating contact from brine drippings?

A—No. Instances in which the markings on refrigerator cars become obliterated due to brine corrosion are rare, and in the few instances where it does occur it is usually caused by defective drain equipment, leaky floor, etc. Splashing of the reservoir from brine drippings released through the drain tube can be prevented by the use of a metal shield. The expense incurred as a result of the few instances in which the markings are obliterated due to brine drippings would be more than offset by the confusion which would be caused if an alternate location for the stenciling were permitted.

194-Q—Inasmuch as the table in Section B of Rule 112 for per pound prices to be used in settlement for destroyed cars was modified in Supplement No. 1, effective August 1, 1955, to include a column covering per pound price for Class A flat cars only, what method is to be used hereafter insofar as flat cars other than Class A are concerned?

A—Per pound prices in the column of this table headed "All Others" should be used in settlement for all types of flat cars other than Class A.

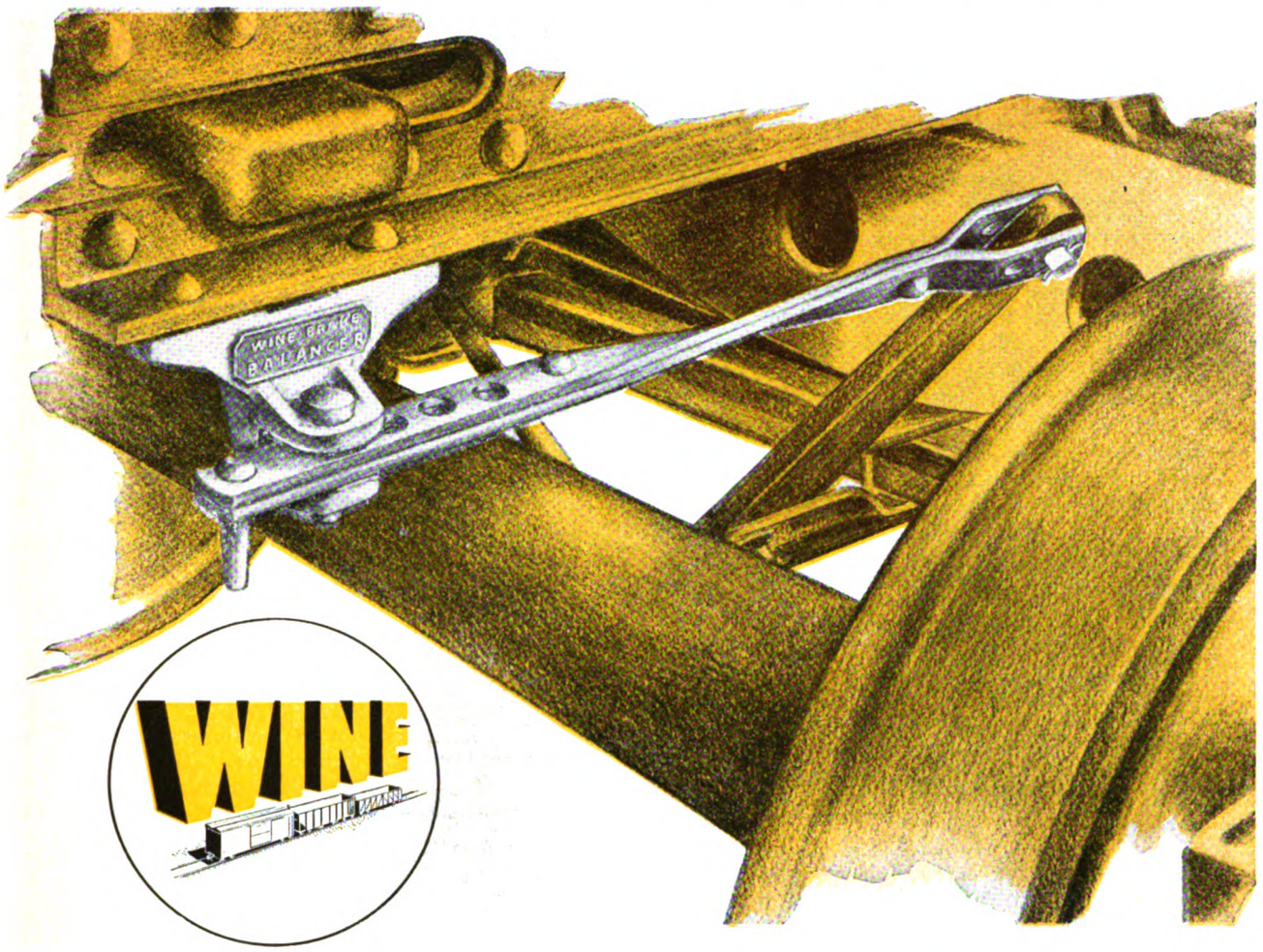
195-Q—How should charges and credits be handled where A.A.R. Standard axle is removed and A.A.R. Alternate Standard tubular axle is applied?

A—The intent of Paragraph (q) of Rule 17 is to permit charge covering the difference between tubular and solid axles regardless of responsibility for repairs. This means that the amount of the charge must be determined by Rule 98, Section (b), which confines the charge in case of handling line responsibility to secondhand value of the axle applied.

196-Q—What would be the proper charge for renewal of pipe bracket and AB cylinder in connection with periodic air brake attention per Item 15 of Rule 111?

A—Second Note under Rule 111 is not intended to permit additional labor charge for R. & R. of four pipe bracket bolts and R. & R. of six cylinder bolts when "AB" pipe bracket and "AB" brake cylinder are

EQUALIZE BRAKE FORCES..



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renewed in connection with Item 15 or 15-A, cleaning of "AB" brakes, as the charges provided in Items 16 and 19 of Rule 111 are intended to cover all labor involved. However, such bolts renewed separately account of being defective (when pipe bracket and cylinder are not renewed) additional labor charge is proper per Items 26 and 27, of Rule 107, whether or not Items 15 or 15-A of Rule 111 are involved.

197-Q—Would it be consistent to establish requirements in the Interchange Rules to provide for the issuance of defect cards in interchange versus delivering road covering tar applied to cracks between floor boards of box cars?

A—No. If such a rule were to be established, same would have to be made effective in interchange in general. This would place an impossible burden on interchange inspectors as it would be necessary to open the doors on all empty house cars to determine whether or not this condition existed and then close such doors. Furthermore, this condition could not be detected on loaded house cars, with the result that the road on which the car was unloaded would have to assume responsibility for this condition when next delivered empty in interchange, even though such road might be entirely innocent.

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G318-Q—What will result from a blown battery charging (auxiliary generator output) fuse?

A—The auxiliary generator will be cut off from the low voltage system and force the battery to supply the low voltage requirements.

Auxiliary Generator Field Fuse

G319-Q—What protection is given by this fuse?

A—This is a 30 ampere fuse and protects the auxiliary generator field windings against excessive current.

G320-Q—What will result from blowing of this fuse?

A—The auxiliary generator will be prevented from supplying current to the low voltage system.

Voltage Regulator

(Manual 2130, page 313)

G321-Q—What is the function of the Voltage Regulator?

A—To cause the auxiliary generator low voltage to remain at approximately 74 volts, whenever the engine is running.

Wheel Slip Control

G322-Q—What action is initiated if a pair of wheels slip?

A—If a pair of wheels slip, one of the wheel slip relays initiates the action that (1) lights the wheel slip light, (2) inserts a choking resistor in the main generator shunt field circuit, (3) opens the battery field circuit and (4) moves the load regulator toward the minimum field position.

G323-Q—How many interlocks does the wheel slip relay contain?

A—Two.

G324-Q—What is used to provide additional interlocks as needed?

A—An auxiliary wheel slip relay (WSA).

G325-Q—Describe the relays and interlocks in detail.

A—When a wheel slip relay closes, one interlock lights the wheel slip light while the other interlock causes WSA to be energized. When WSA is energized, its interlocks open to insert a resistor in the shunt field circuit and open the circuit to the battery field operating coil.

G326-Q—What action takes place when the battery field contactor opens?

A—When the battery field contactor opens, its normally closed interlock (DC) closes, energizing the overriding solenoid (ORS) in the governor.

G327-Q—What happens when the overriding solenoid is energized?

A—The load regulator moves toward minimum field position.

G328-Q—How is the main generator affected during wheel slip action?

A—Since the shunt field contactor does not open during wheel slip action, a fast but controlled unloading of the main generator is effected.

G329-Q—To what point does generator unloading continue?

A—To a point necessary to stop the slipping.

G330-Q—When this point is reached, what happens?

A—Power is then automatically applied at a slightly lower load than that at which the slipping was terminated.

Ground Relay (GR)

G331-Q—What is the ground relay?

A—Located in the electrical cabinet, it is an electrical protective device connected to the high voltage system.

G332-Q—What is the function of the ground relay?

A—To automatically unload the main generator in case of a ground in the high voltage system.

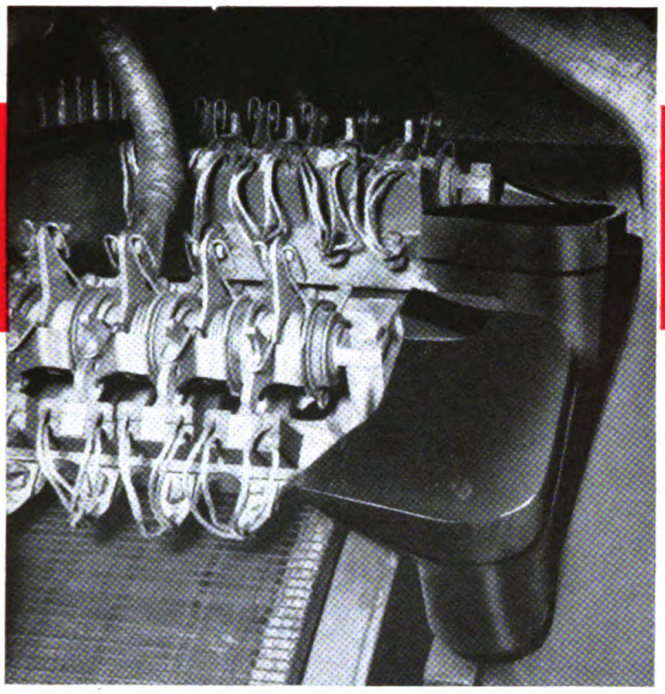
G333-Q—How can a "ground" be defined?

A—As current passing through the frame or car body of the locomotive.

(Manual 2310, page 314-315)

G334-Q—What takes place if a ground occurs in the high voltage system?

A—The ground relay will trip.



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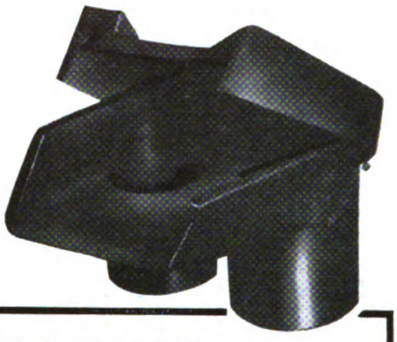

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Questions and Answers

Fairbanks-Morse
Diesel-Electric Locomotives

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F294-Q—What are the locations for filling?
A—Filling is through a filler pipe with a corrugated male coupling located one on each side of the locomotive, or through the roof filler vent pipe in emergency.

F295-Q—How may it be known when filling is completed?
A—When filling from the side, water should run into the system until it starts to run out the opposite filler pipe.

F296-Q—What are the various cooling system capacities in gallons?
A—1,600 hp—300 gallons; 2,000 hp—320 gallons; and 2,400 hp—340 gallons.

F297-Q—What takes place if the system is filled with engine running and then the engine is shut down?
A—Water will overflow until the radiators drain.

F298-Q—What should be done after filling an empty system?
A—Run engine for several minutes to eliminate air pockets; then shut down engine and after five minutes add more water if needed.

F299-Q—What precaution should be observed if a hot engine has been drained?
A—Never refill with cold water. Doing so may cause liners to crack.

Draining Cooling System

(Bulletin 1706—118-A, page 5)

F300-Q—How should the radiators, oil cooler and engine water tank be drained?
A—Open valve at bottom of engine water tank.

F301-Q—What is done to drain engine exhaust manifold water jacket?
A—Open valve at pump end of engine.

F302-Q—How would you drain the cab heaters?
A—Open cab heater drain valves located in the engine room on each side opposite the main generator.

F303-Q—What else should be done?
A—Remove drain plug from the water pump.

Adding Water Treatment

F304-Q—Where is water treatment added to the system?
A—Through a plug in the top of the engine water tank on the left side.

Cold Water Precautions

F305-Q—What must be done when an engine is shut down in freezing weather?
A—The cooling system must be drained or steam supplied through the standby lines.

F306-Q—How is steam admitted to engine water tank?
A—Open valve in steam line to engine water tank. Valve is located on floor just ahead of the left engine room side door.

F307-Q—How is steam admitted to the engine water jacket?
A—Open valve in its steam line. Valve is located at the pump end of the engine.

F308-Q—How is steam admitted to the cab heaters?
A—Open valve to the heaters in their steam line. Valve is located overhead in the nose.

F309-Q—What precaution must be taken when applying steam to cab heaters?
A—Always have water on at the same time because live steam alone will melt the heater elements.

F310-Q—Should steam be admitted to the cooling system when the engine is running?
A—No; the engine will overheat.

F311-Q—What should be done with steam-generator-equipped units when an engine is shut down?
A—Standby steam should also be admitted to the steam generator water tanks and sanitary water tank.

F312-Q—Where is the steam admitted for this purpose?
A—Standby steam is admitted to the unit through a 1-in line into the main steam line at the left rear of the car body.

Electrical Control System. Description of Parts

(Bulletin 1706, 132A, Page 1)

F313-Q—What is the function of the Load Ammeter?
A—Indicates current to traction motors on front truck.

F314-Q—What is the function of the Standby Lighting Switch?
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F315-Q—What is the duty of the solenoids in electro-hydraulic governor?
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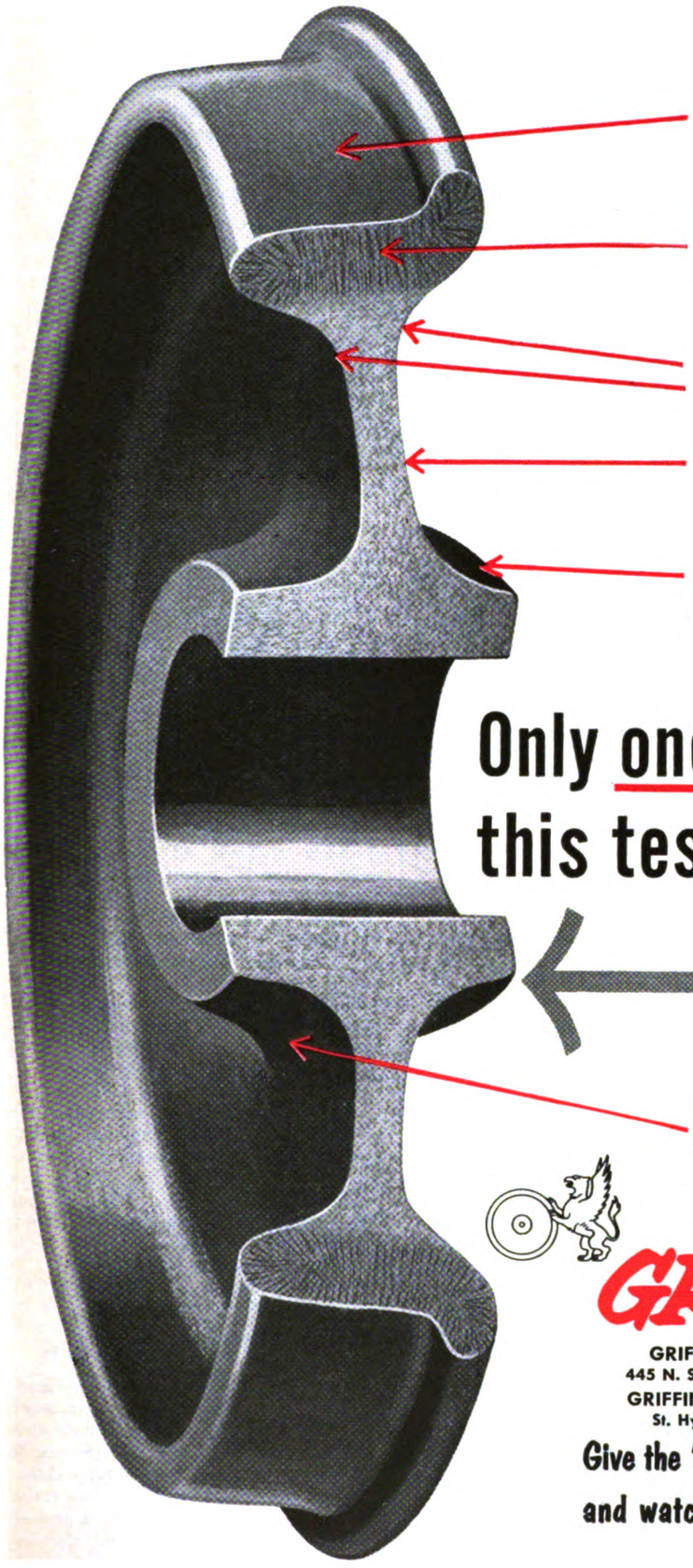

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Long sweeping fillets under flange and rim of EQS wheels insure greatest possible strength.

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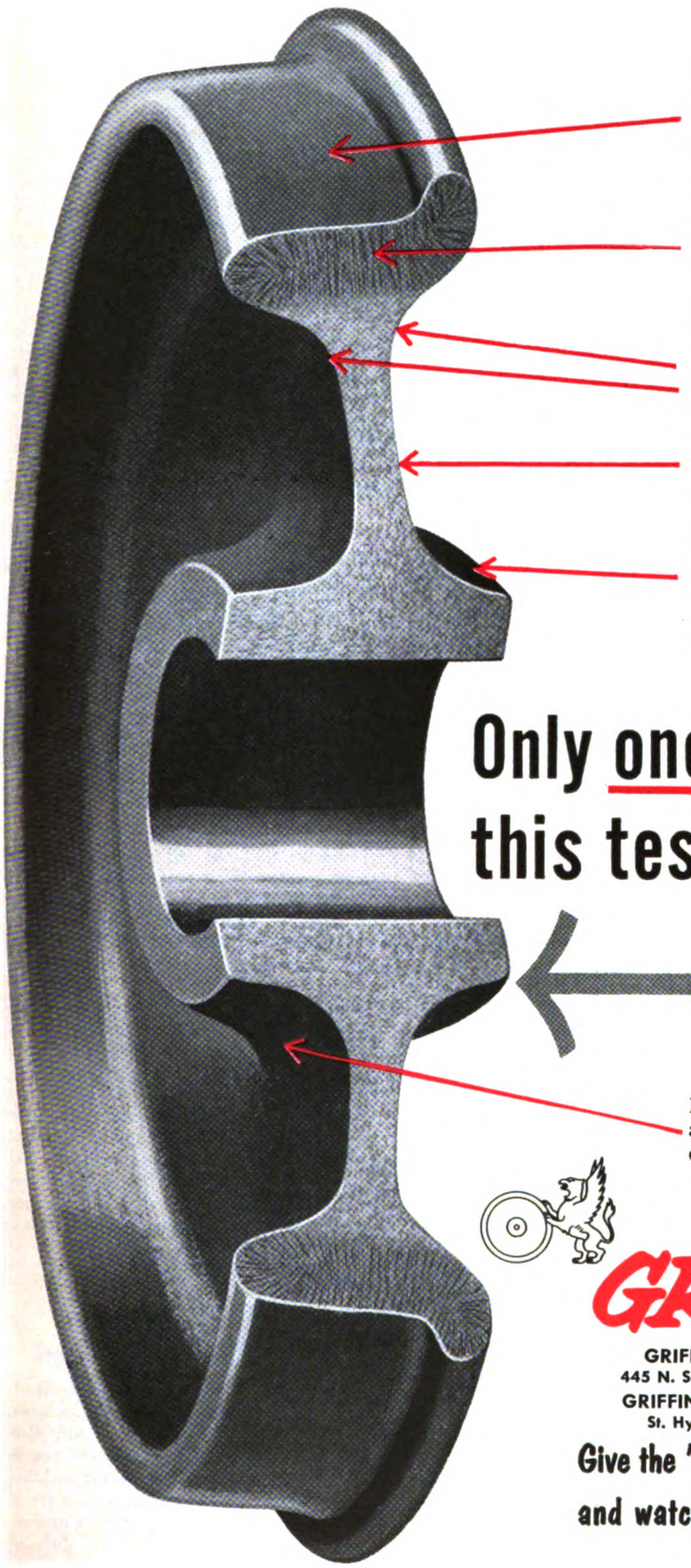

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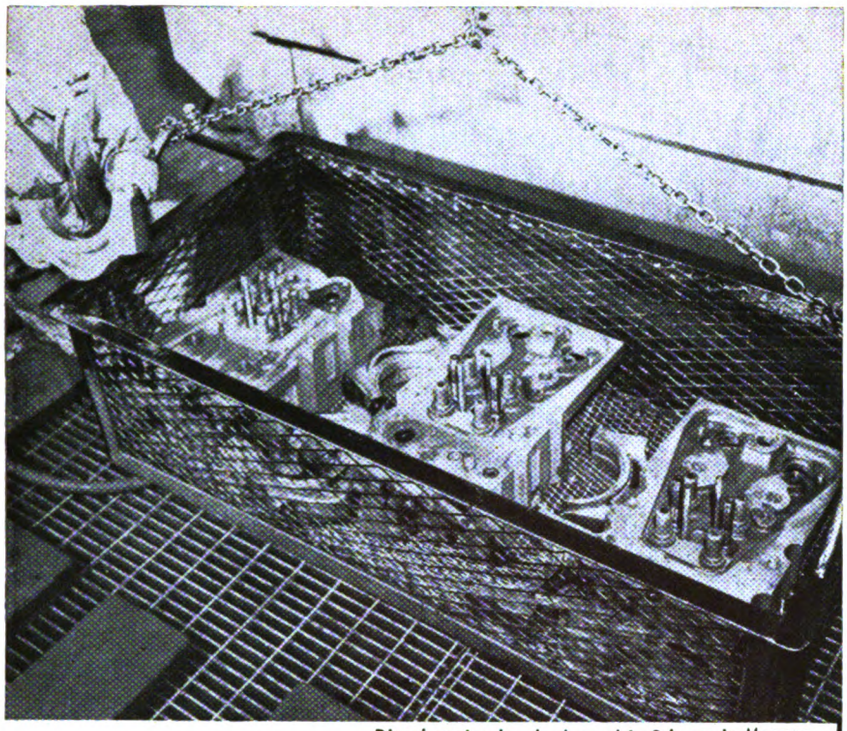

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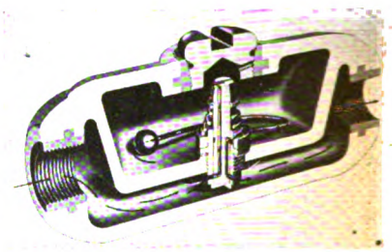
EQUIPMENT

(Continued from page 22)

adjusting nut. The tool is made in a range of sizes to fit machines with spindle diameters from 3 in. through 8 in., and draw key slots from 33/64 x 1⅛ in. through 11/16 x 1⅜ in. A wide range of wedge adjustment accommodates variations in shank and spindle slot location. There are no attachments to the machine spindle and, in use, the key is entirely within the spindle slot.

The tool shank is inserted in the spindle, the adjustable draw key is inserted through the spindle and shank slots, and the adjusting nut in one end of the key is turned with an Allen wrench. This expands the wedge in the key to seat the tool shank securely in the spindle and lock it there until the adjusting nut is reversed. This adjustable key can be completely disassembled for cleaning and lubrication by removing two pins. All parts then come out of the body barrel except the wedge which slides out of its own slot. *Davis Tool Division, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.*



Air-Line Lubricator

This lubricator provides a constant supply of finely atomized oil that thoroughly covers each working part with a protective coating of lubricant. For ease in handling, the body is lightweight aluminum alloy. It has threaded steel inserts for long wear, and is designed for direct air-hose connection.

The lubricant is made in two sizes. Model IRO-8 is for use with tools utilizing 14 to 130 cu ft of air per min. Its capacity is ½ pt. Model IRO-16 is for tools using 40 to 200 cu ft of air per min and has a capacity of 1 pt. The feeding valve is adjustable for all standard lubricants and will operate satisfactorily over the entire normal working temperature range. Lubrication can be shut off when not in use. The lubricator will operate in any position. *Ingersoll-Rand, 11 Broadway, New York 4.*

Portable Electrical Cord

U.S. Laytex Royal Master cord is made for use with grinders, drills, power saws, buffers and other types of heavy-duty electrical tools. It incorporates features new in cord construction. The manufacturer claims its product has 488 per cent greater resistance to flexing than the average of present, old cured cords; is 118 per cent more re-

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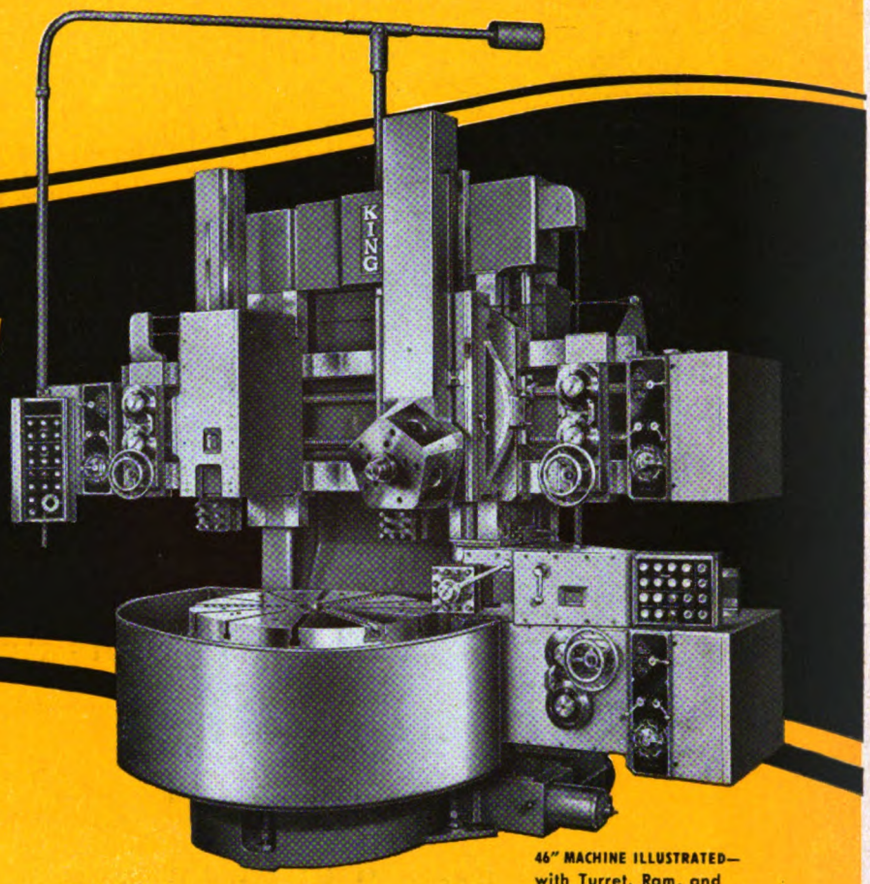

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Advanced engineering of mountings for spindle and for all heads and turrets—substantially increased machine rigidity —will give you *greater-than-ever accuracy.*

With maximum use of *unit* construction and many components redesigned to reduce wear, you'll have a minimum of machine maintenance and downtime.

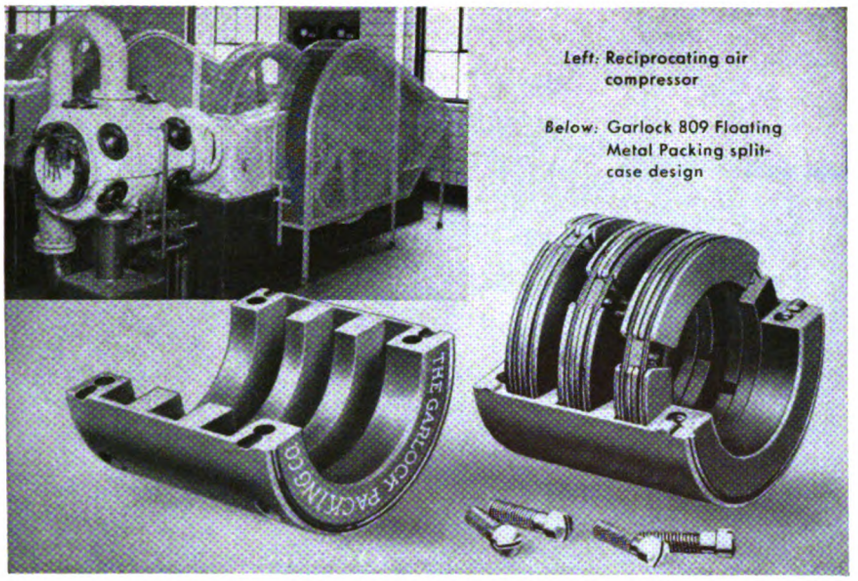
For full details on new model King machines send for new Catalog K-5 covering 30", 36", and 46" sizes. (Catalogs on larger sizes will be available later.) Write to us direct or to the King distributor in your area.

Here are a few of the many advanced KING *features....*

- 40 to 50 H.P. on 30" to 46" sizes.
- 75 to 100 H.P. on sizes 56" and up.
- 24 feeds available.
- Feed selection from direct-reading dial.
- 24 speeds in geometric progression in any of three standard ranges.
- Pendant-located control of:
  - pre-selective speeds from direct reading dial.
  - speed change.
  - head movements in either feed or rapid traverse.
  - power swiveling of rail heads at rapid traverse or feed rate.
  - power indexing of rail head turret and side head tool block (optional).
- Automatic lubrication of all moving parts.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 Tennessee Ave., Cincinnati 29, Ohio

KING Vertical Boring and Turning Machines



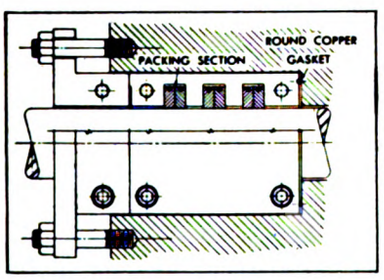
Left: Reciprocating air compressor

Below: Garlock 809 Floating Metal Packing split-case design

For air compressors, users report

GARLOCK SPLIT-CASE METAL PACKINGS

have 2 big advantages



1. **LONG, TROUBLE-FREE LIFE.** Minimum of 7 years with proper lubrication.

2. **CAN BE INSTALLED *WITHOUT* DISCONNECTING THE ROD.** Downtime is reduced to a minimum.

You can eliminate the cost of frequent packing replacements and unnecessary downtime by installing Garlock split-case metal packings on your reciprocating air compressors. Service reports show that these Garlock metal packings have given 15 years and more of trouble free service with a minimum of rod wear.

For complete information, call your Garlock representative or write today for Brochure 3889.

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Sales Offices and Warehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N.Y.), Philadelphia, Pittsburgh, Portland (Ore.), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa

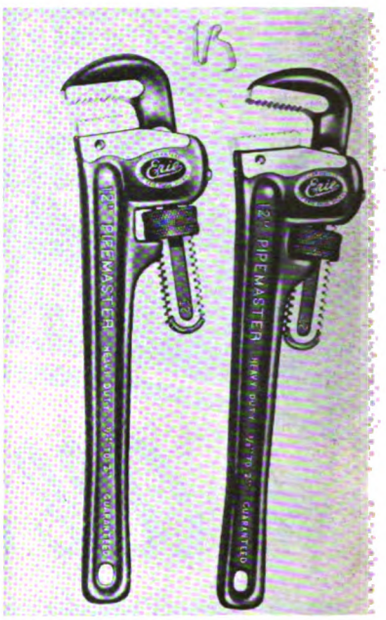
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

PACKINGS, GASKETS, OIL SEALS,

MECHANICAL SEALS, RUBBER EXPANSION JOINTS

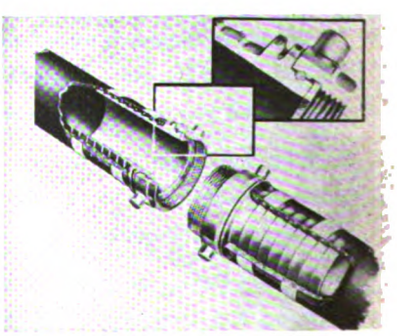
sistant to tearing, and has 197 per cent greater impact strength. It is also 26 per cent more oil resistant, 33 per cent more heat resistant, and has 38 per cent more breaking strength, 50 per cent more resistance to cutting, and 58 per cent more abrasion resistance. *United States Rubber Company, Rockefeller Center, New York 20.*



Heavy Duty Wrench

This wrench is equipped with a Z-shaped spring that is notched to fit under a pin running transversely through the wrench housing, the pin acting as a pivot. The spring is said to give a double action in the wrench operation; the bite and release are much easier and more rapid, and ratcheting is improved.

Designated the Pipemaster, the wrenches are made in 6 in. through 48 in. sizes with straight handles, and 8 in. through 18 in. in the offset type. *The Erie Tool Works, Erie, Pa.*

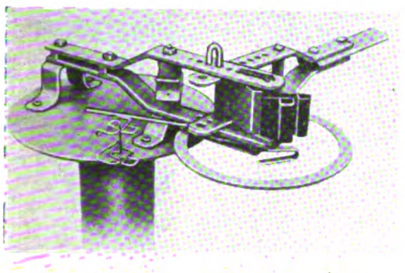


Shank Hose Coupling

Designed for handling petroleum products, this coupling can be utilized with any liquid where suction or discharge is involved. A replacement pin lug or hex swivel nut and a cast-in flange are two of

the features of the Universal union shank hose coupling. A tie wire, which secures the swivel ring to the shank, permits easy replacement should the threads ever be damaged.

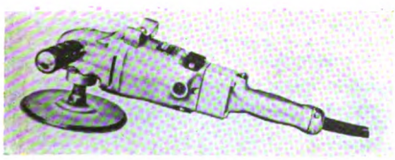
The cast-in flange acts as a cushion upon which the hose end rests. A groove in the flange provides anchor area for hold-back wire to prevent pulling apart of hose under severe pressure conditions. The coupling designated as No 800, is available in 2 and 3 in. sizes. Other sizes are available on request. A corrugated shank gives positive hose gripping area without injuring the hose. *Universal Valve Company, P.O. Box 444, Elizabeth, N.J.*



Bending Dies

Six bender dies for maintenance and production work in metal-working shops can be utilized to bend rounds, pipe, flats, tubing, squares, conduit and angle iron.

The Bulldozer die makes round or square bends on flatstock up to 3/16 in. thick and 4½ in. wide. It can also be used for making intricate bends on wire up to ¼ in. diameter. The Edgebend die, two to a set, bends flat stock sideways. Capacity is ¼ by 1¾ in. cold. The Special O.D. steel tubing die, in 11 sizes from ⅜ to 2 in., bends from 1¼ to 24 in. radii. The Special pipe die makes close return bends on pipe with radii from 1¼ to 36 in. Eight sizes are available. The 90-deg conduit die can be used for bending standard pipe and rigid conduit and is available in seven sizes from 1½ in. down to ⅜ in. The Thinwall electrical metallic conduit die can be used to bend conduit in sizes from ½ to 2 in. Full round and smooth bends are made without wrinkling. *Hossfeld Manufacturing Company, Winona, Minn.*



Portable Sander

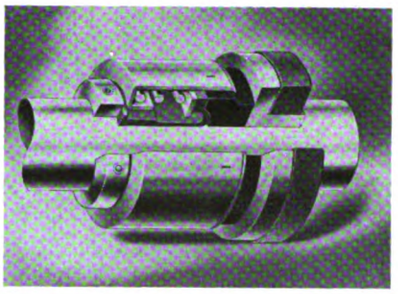
According to the manufacturer, this tool possesses 20 per cent more power than its predecessor, yet the weight has been reduced by 20 per cent. The motor of the 7 in. sander has been redesigned and tailored for the requirements of general-purpose maintenance and production work.

The device employs a centrifugal fan, affording great air velocity through the commutator section. Its handle has been redesigned for a more comfortable grip.

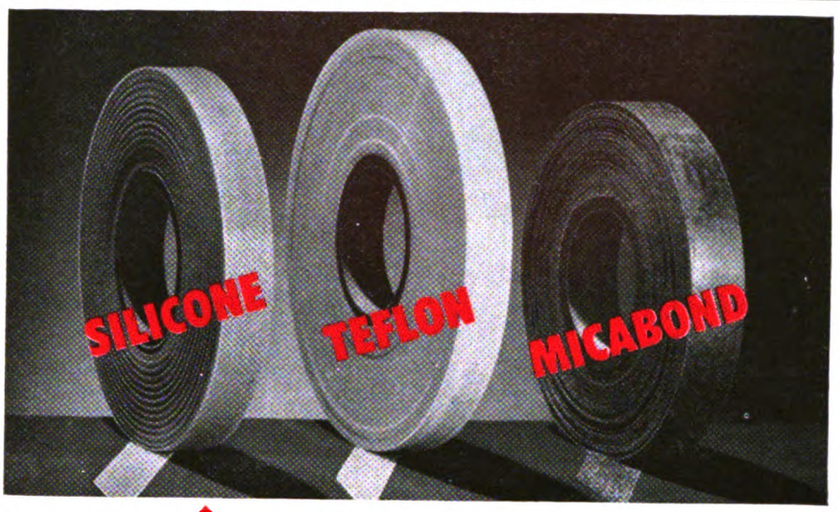
Heat-treated spiral bevel gears gives a smooth, constant transmission of power from the motor to the spindle. The motor operates at 4,250 rpm and the unit has a net weight of 10¾ lb and an overall length of 17¾ in. The tool is available for either 115 or 220 volt a-c or d-c operation. *Black & Decker Mfg. Co., Towson, Md.*

Rotary Shaft Seal

The BB-21A Mechanipak Seal is a mechanical seal for use on rotating shafts at pressures up to 150 psi. Standard construction



consists of a brass shell, brass washer, and Buna-N Bellows. Seals are available for shafts from ⅜-in. to 3-in. dia. Buna-N or Neoprene bellows are supplied for operating temperatures up to 212 deg F and pressures to 150 psi; silicone bellows are



Three CDF TAPES to meet your heat and electrical insulating needs

C-D-F Silicone Tapes for A.I.E.E. Class H Electrical Insulation. Available in Varnished Fiberglas cloth and Silicone Rubber-coated Fiberglas cloth. Resistant to high temperatures; high dielectric strength, low dielectric losses, excellent moisture resistance and high tensile strength. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated solvents. Available in a range of sizes on continuous rolls. Write for Technical Bulletin #47.

C-D-F Tapes of Teflon* have the desired mechanical and electrical properties for heavy duty motor, generator, and conductor insulation. Unaffected by temperature fluctuations, exposure to oils and greases, or weather conditions. Fiberglas supported and unsupported Teflon tapes are available in a range of sizes.

C-D-F Micabond Tapes have an inherently high and permanent resistance to heat with good dielectric properties. Micabond Tapes are used for insulating motor and generator armature and field coils, turbogenerator coils, and many similar applications where flexible high quality insulation of A.I.E.E. Classes B and H insulators are required. Available in a wide range of sizes with many different backings including: fiberglas, silk, Cellophane*, cotton, paper, and Mylar*.

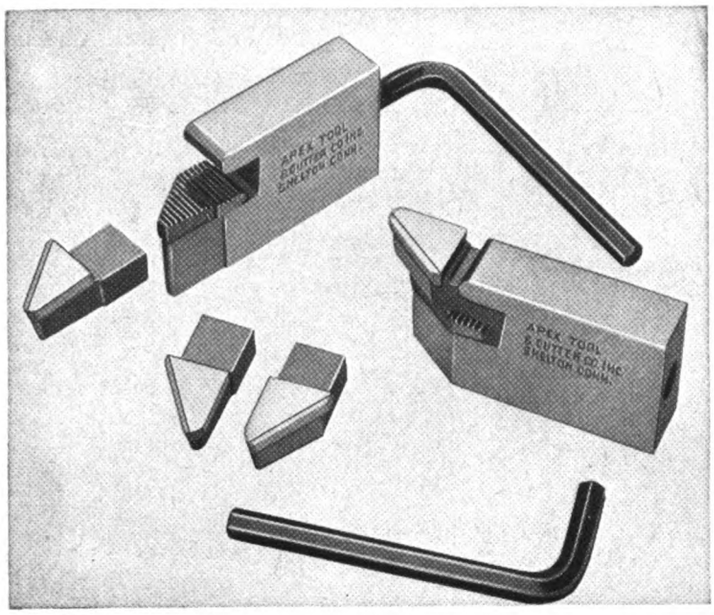
If you have an insulating problem, probably a C-D-F product is the answer. C-D-F manufactures and fabricates electrical insulation, laminated and molded plastics. Sales offices are located in principal cities. Call your C-D-F sales engineer—he's a good man to know!

*du Pont trademarks.

CDF Continental-Diamond Fibre

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.
NEWARK 104, DELAWARE

SPECIAL *APEX* HOLDERS AND TOOL BITS FOR ONLY "SELLERS" AXLE-FINISHING LATHES



For Economy, Increased Production, and Accurate Regrinding of Angles with Fixtures

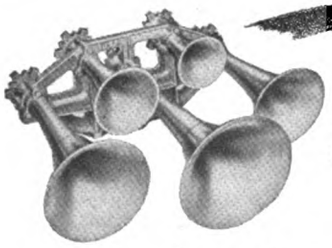
Standard holders with inserted carbide-tipped tool bits reduce your costs and give improved working conditions. All tool bits are furnished finished ground with chip breakers and are ready for immediate use. Tool bits are adjustable in two directions to compensate for wear.

Full details mailed upon request.

The Apex Tool & Cutter Co., Inc.
Shelton 22, Conn.

See our complete line of tools for railroad work at Booth 855, The Production Engineering Show, Navy Pier, Chicago, Sept. 6-16.

PROVED!
BEST BY TEST



• **In two years of actual road service, Leslie-Supertyfon Air Whistles have proved most dependable, most audible, most trouble-free of all air whistles.**

SEND FOR — Technical Data Sheet 531

LESLIE® SUPERTYFON

LESLIE CO., 275 Grant Avenue, Lyndhurst, New Jersey

Hurry . . . while our head is still in the sand!

"NEW ONES FOR OLD"

Sweeney POWERENCH **EXCHANGE**

We have developed a new POWERENCH for use on the cylinder head crab nuts of E.M.D. 567 series engines. This "New Ones for Old" Exchange is offered for a limited time only to enable users of old style POWERENCHES to take advantage of the new style POWERENCH at a considerable savings. Here's the deal:

In exchange for your old style #224 or #225 series POWERENCH (regardless of its condition) we will give you a new, Model 104 POWERENCH at 60% of the regular price of the new POWERENCH.

Old style POWERENCH

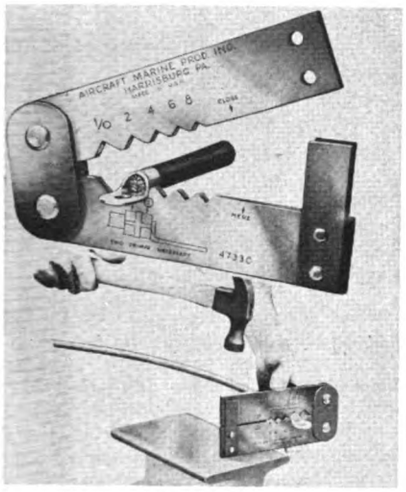
New style Model 104 POWERENCH

Lighter, the new Model 104 POWERENCH weighs only 28 lbs., compared to the 40 lbs. of old POWERENCHES. Stronger, the new units are strength tested to 10,000 ft. lbs. output, compared to the 5,400 ft. lbs. of the old units. More efficient, the new unit has a 12:1 power ratio, compared to the 7.2:1 ratio of the old units. The new unit will efficiently handle E.M.D. 567C engines, as well as 567, 567A and 567B. ***Write for particulars!***

B. K. SWEENEY MFG. CO. • DENVER 17, COLO.

used for temperatures up to 400 deg F where pressures do not exceed 50 psi.

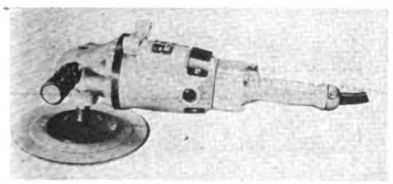
The seals are designed for use on centrifugal pumps gear boxes, speed reducers, agitators and similar applications. They are said to eliminate wear on shafts and sleeves, to eliminate fluid leakage, and to cut maintenance costs. *Garlock Packing Company, Palmyra, N. Y.*



Wire Terminal Crimping Tool

The Vize-An-Ammer, is said to offer the small maintenance shop a solution to the solderless wiring of stranded and solid wire in sizes ranging from 8 to 1/0, with A-MP terminals and connectors. The unit's diamond-shaped crimp is designed to produce a connection with maximum conductivity and tensile strength.

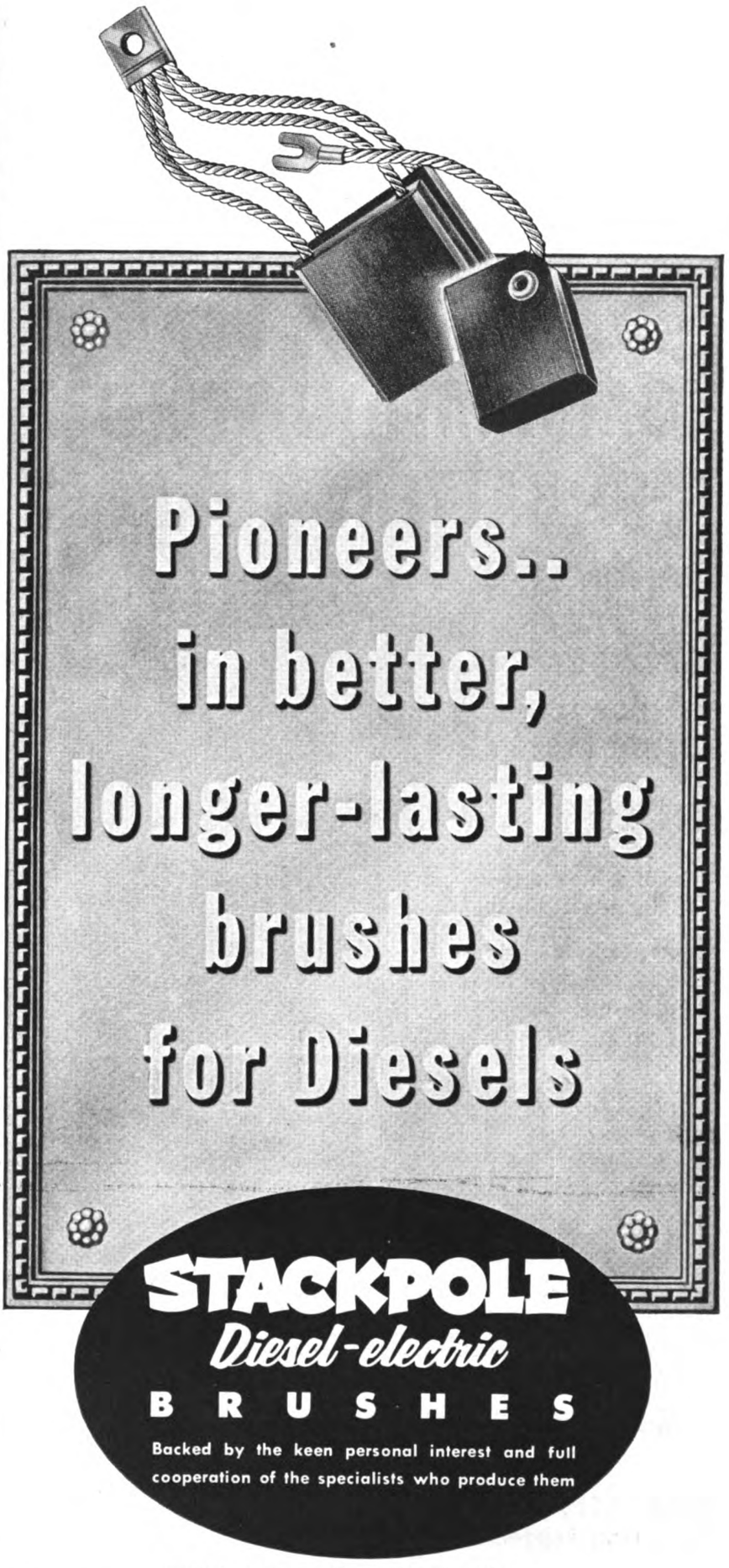
The unit is simply squeezed and hammered until the jaws meet to insure that a good crimp has been made. It is fabricated from heat-treated tool steel. *American Pamcor Inc., 1801 Hillcrest avenue, Havertown, Pa.*



Heavy-Duty Sander-Grinder

The tool is available in three different speeds and has a universal motor designed for continuous duty. Said to be more powerful than the previous model, the weight of this 9 in. device weighs four pounds less.

A centrifugal fan pulls air through the commutator section to provide a cool-running motor. This fan also keeps the motor almost entirely carbon and dust-free. The



STACKPOLE CARBON CO., ST. MARYS, PA.

lower steel inspection plate has been designed to act as a rub-cover and to seal the lower side of the tool from abrasive dust. Its operating switch is inclosed in a dust-proof compartment, and is guarded against being switched "on" accidentally.

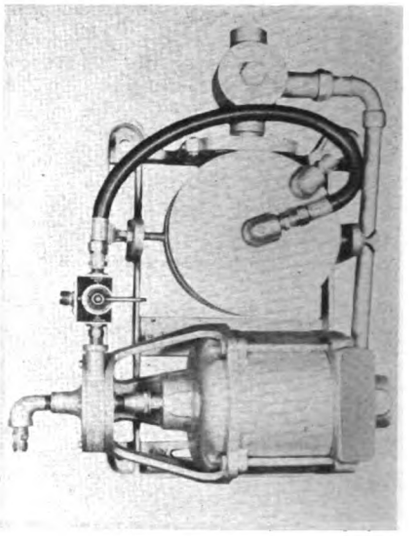
The device's rear handle is sufficiently large to afford ample finger room; and the side handle can be mounted on either the right or left side. A convenient locking pin permits easy accessory removal.

It is available in speeds of 4,200, 5,200 or 6,000 rpm with either a 115/or 220-volt motor for operation on either a-c or d-c. Overall length is 18 3/16 in. and weight is 14 lb. *Black & Decker Mfg. Co., Towson, Md.*

Burst-Proof Steam Hose Line

This burst-proof steam hose line, said to have longer life, higher efficiency, and maximum safety, has a grease-resistant cover for special applications. It is a combination of the manufacturer's little gem fitting and burst-proof steam hose, and can be used for applications up to 200 lb pressure. High temperatures do not affect the hose.

Both types of steam hose, No. 1524 standard and No. 2750 grease-resistant covered, are available in ½, ¾ and 1 in. sizes. *Aeroquip Corporation, Jackson, Mich.*

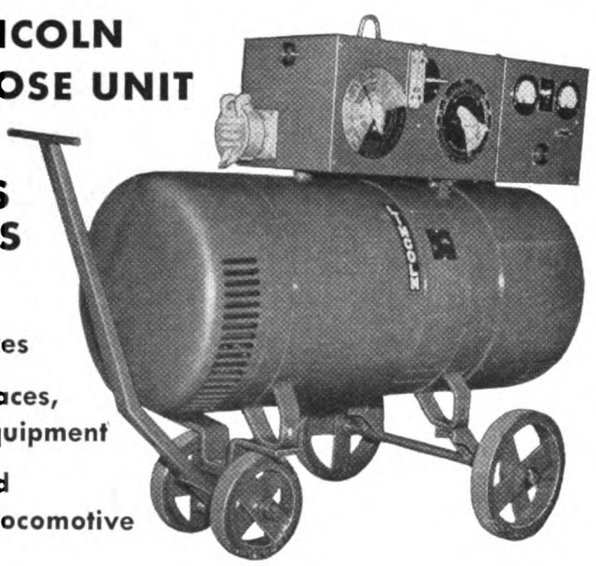


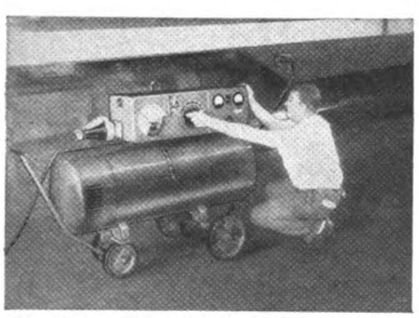
COMBINATION WELDER AND BATTERY CHARGER

NEW LINCOLN DUAL PURPOSE UNIT

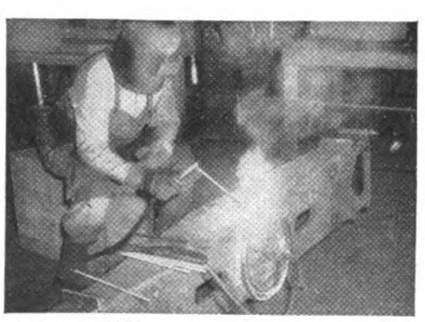
- **WELDS**
- **CHARGES BATTERIES**

- **Built in 200, 300, 400 amp sizes**
- **Repairs, hardsurfaces, builds railroad equipment**
- **Charges Lead-acid and Edison-type locomotive and car batteries**





As a Charger *— Simple to Set for recommended charging rates of lead-acid or Edison-type batteries. Meter shows exact charging rate.*



As a Welder *— Provides all benefits of Lincoln Shield-Arc with Dual Continuous Control. Mounted on wheels for easy movement.*

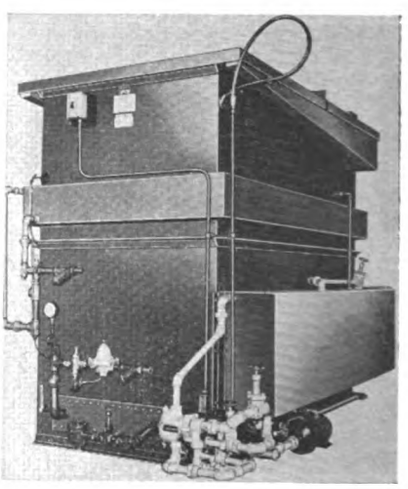
Get Details Specifications on Lincoln Battery Charger and Welder combination are available by writing the Lincoln Electric Railway Sales Company, 11 Public Square, Cleveland 13, Ohio. • Railroad representative of:

THE LINCOLN ELECTRIC COMPANY

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Spray Paint Heater

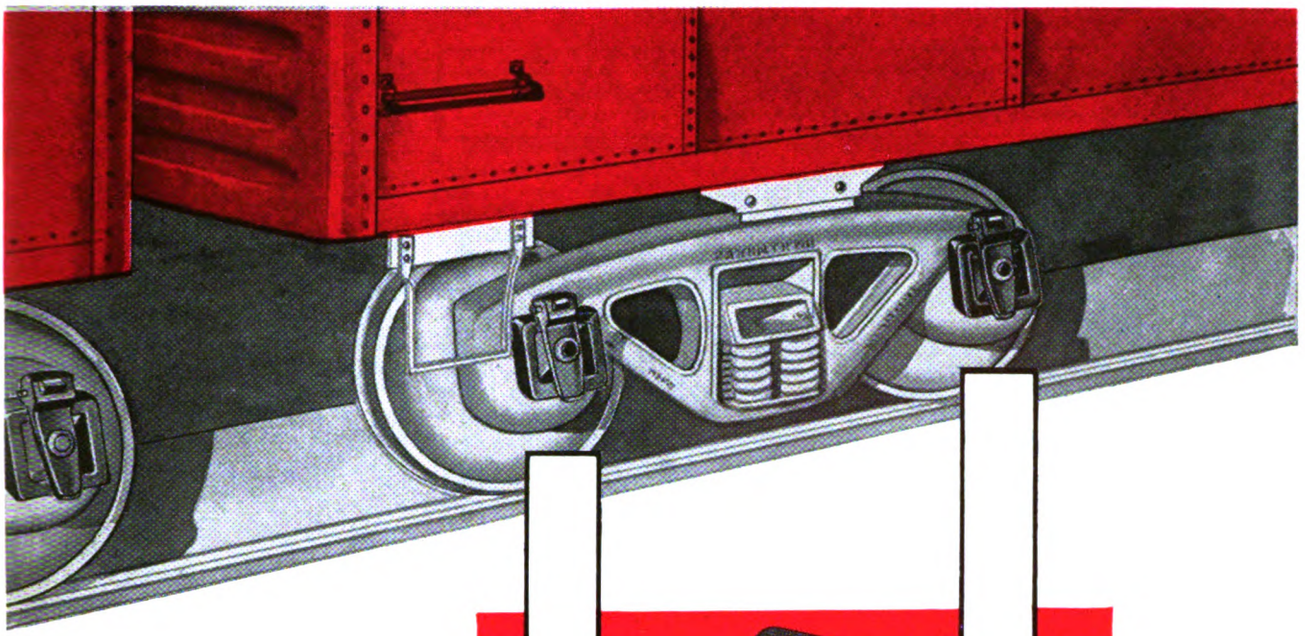
For hot spray painting, the Circaflo 300 provides uniform viscosity paint and a controlled application temperature. Longer life and better coverage are claimed for standard industrial finishes when applied with this hot-spray heater. The unit has a coilless heat exchanger and the Circaflo pump. This pump has no bearings or close tolerances to wear, and is equipped with a ¼-hp. explosion-proof electric motor. Two coats of finish can be replaced with a single, time-saving, sag-proof application of heat-reduced, high-solids paint. *Spee-Flo Corp., 720 Polk avenue, Houston 2, Texas.*



Heavy Duty Vapor Degreaser

This heavy duty degreaser has been developed to solve the problem of draining off heavily laden and contaminated degreasing solvent, permitting longer operation between cleanouts. The units, electric, gas or steam-heated, are suited for use by railroads, truck repair shops and heavy industry.

A double sump for sludge is a feature of the device. One of the sumps contains the heating element which brings the solvent



On the nation's "Iron Highways" those who know *Specify*

MOTOR WHEEL LIDS

Motor Wheel's time-tested lid design with full 4-way articulation . . . full pressed steel construction . . . and precision manufacture . . . provides *plus* protection against entry of destructive foreign matter.

Easiest of all lids to install or remove . . . *no tools needed.*

Millions of Motor Wheel lids now in use are giving dependable service.

STANDARD MODEL

Motor Wheel Corporation
LANSING 3, MICHIGAN, U.S.A.

National Railway Sales Representative
T-Z RAILWAY EQUIPMENT CO.
G. S. TURNER, President
8 South Michigan, Chicago 3, Illinois

Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information. Requests will be forwarded direct by the manufacturers.

1. TWO-LEVEL COACH. *Pullman-Standard Car Mfg. Co.* 4-page 2-color folder (J-2385) "New Pullman-Standard Two Level Suburban Coach Built For The Southern Pacific Railroad" describes and illustrates this new coach; includes partial list of materials and equipment used.

2. DIESEL-ELECTRIC LOCOMOTIVES. *Baldwin-Lima-Hamilton Corp.* 8-page 2-color 3-hole punched bulletin (2005) "General Specifications For Standard Units, Baldwin-Lima-Hamilton Diesel-Electric Locomotives" describes six of the company's locomotives now fitted with new electrical equipment.

3. ROLLER BEARINGS. *Dodge Mfg. Corp.* 52-page profusely illustrated bulletin (A-638) "Dodge Rolling Bearings" features the new SCM line of ball bearing pillow blocks and flange cartridge mounts, contains technical data and list prices on complete line of Dodge SC ball and Dodge-Timken roller bearings.

4. CABLES. *The Okonite Co.* 8-page 3-hole punched pull-out (OK-1069) "Okonite's Strip-Insulating Process", Its components . . . its features . . . its advantages in diagram style shows production, control and inspection methods used in manufacture of Okonite-Okoprene cables.

5. ALUMINUM EQUIPMENT. *Reynolds Metals Co.* June 1955 issue of *Reynolds Aluminum Digest* contains special article "Aluminum in Railroad Equipment" discussing use of aluminum alloys in construction of railroad rolling stock.

6. CAR WHEEL BORER. *Niles Tool Works, Baldwin-Lima-Hamilton Corp.* 12-page 2-color bulletin (101554) "Niles Hydraulic Wheel Borer" describes each operating component, illustrates and gives specifications for the hydraulic car wheel borer.

7. POSITIONER. *Worthington Corp.* 8-page 2-color bulletin (R-1700-B15) "It's Easy To Choose The Right Positioner" outlines seven basic points for consideration in positioner selection, photos illustrate parts.

8. FORGINGS. *National Forge & Ordnance Co.* 4-page folder "NF Product Examples" shows with many illustrations a variety of different forgings produced by National, including crankshaft for diesel driven compressor and diesel locomotive shaft.

9. BRONZE GLOBE VALVE. *Lunkenheimer Co.* 4-page 3-color circular 602 "Biggest Bronze Valve News in 50 Years! . . . The LQ600 Valve" illustrates and describes the new LQ600 bronze glove valve with Brinalloy seats and discs; includes cut-away parts identification drawing.

10. POLYETHYLENE CABLE. *Anaconda Wire & Cable Co.* 4-page 2-color folder (DM-5450) "Anaconda Cathodic Protection Cable" describes, diagrams, and gives specifications on the new direct burial Type CP cable with double jacket to check corrosion.

11. SPOT WELDING. *Air Reduction Sales Co.* 12-page reprint (ADR 93) "Spot Welding From One Side—With A Portable Gun" describes and illustrates Aircospot inert-gas-shielded tungsten—arc spot welding process.

12. EYE SAFETY. *Silicon Paper Company of America.* 14-page booklet on sight and eye safety covers the eye, how it works, how it can be injured through misuse, steps taken to aid recovery.

13. FREIGHT CAR ENAMEL. *Sherwin-Williams Co.* 4-page 2-color brochure (S-3495) "New One-Coat Cold Spray, The Equal of Two Standard Coats!" describes Kem-Kold Bild synthetic freight car enamel; includes technical data and application photos.

14. LUBRICATED PLUG VALVES. *Homestead Valve Mfg.* 28-page reference book (39-5) "Homestead Lubricated Plug Valves, Stem-Sealed Self-Freeing Plug" shows straightway, 3-way and multiple port lubricated plug valves for 250 pounds oil-water-gas and 150 pounds steam working pressure.

15. COMPRESSOR. *Ingersoll-Rand Co.* 4-page 2-color bulletin (1540) "Now, a 20-hp. Air-Cooled Compressor With The Famous I-R Channel Valve" describes and illustrates the I-R Model 20T compressor with I-R Channel Valve.

16. VALVES. *The Fairbanks Co.* 20-page reference manual "The Fairbanks Valve Comparison Chart" provides simple, easily read, easily referred to charts, detailing the complete Fairbanks line of bronze and iron-body valves compared with valves of other manufacturers.

17. PRESSES. *Cleveland Crane & Engineering Co.* 4-page 2-color catalog (2019-A) "Steelweld Single-Point Presses" describes, illustrates and gives specifications for the Steelweld line of Single-Point Presses ranging in size from 150 tons up.

Reader Service Department **SEPTEMBER, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17

Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

Company .....

Address .....

City ..... **Zone** ..... **State** .....

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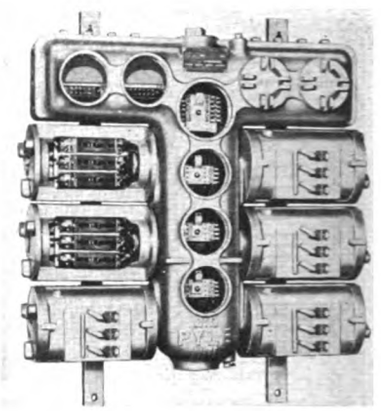
up to a boil. The other is a repository for the contaminated solvent which runs off from a drain plate above the boiling sump. A removable sludge pan can be emptied and replaced with a minimum interruption of work. A flusher pump and spray can be installed to flush out soil from recesses in the ports.

Units are available in four different standard sizes, handling work requirements from 4000 to 12,000 lb per hr. Vapor level is controlled by means of a water jacket. Automatic shut-off controls for protection against overheating are provided where required. The units are arc welded steel construction, reinforced, metallized and painted on the exterior with solvent resistant paint. *Phillips Manufacturing Company, 3541 W. Touhy avenue, Chicago 45.*



Explosion-Proof Panelboard

This unit, made in cast aluminum, has been designed for hazardous locations. Its triple-sectioned grooved joint meshes cover, end plate and body to form a continuous metal-to-metal explosion-proof seal. Approximately three turns of the end plate releases the cover for complete visibility and quick access to the branch circuit breakers.

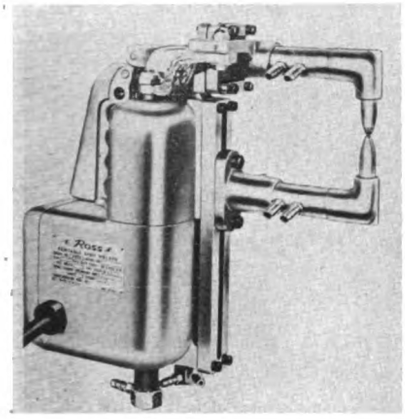
This EBP series is available in 2, 4, 6 and 8 gang types. The units take an E frame and Quicklag circuit breakers with from 2 to 24 branch circuit breaker controls. *Pyle-National Company, 1334 N. Koster avenue, Chicago 51, Ill.*

Electrically Conductive Lubricant

Primarily a lubricant, Conducto-Lube allows joint tension to be adjusted to original factory specifications so that full rated-capacity of the switch can be maintained at all times. It is said to eliminate any possibility of the switch balling up and freezing under extended use. It is highly conductive and will eliminate any hot spots in hinge switch joints caused by poor contact, thereby raising or restoring the rated capacity of the component. It can also be used for high speed air-blast breakers where a lubricant is essential. Its con-

ductivity will reduce resistance and heating.

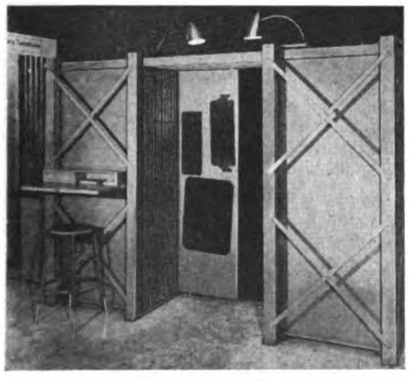
The product comes in 6 oz jars. *Conducto-Lube Company, 8603 S. W. 17th avenue, Portland 19, Ore.*



Portable Spot Welder

This self-contained unit, completely water-cooled, is enclosed in an aluminum housing. It features a built-in electronic timing control of the thyratron type, operating a solenoid contactor. Amperage is over 17,000 at the point of weld. The device has a throat depth of 6 in. with variable openings from 3 to 11 in., and can be used to weld steel and other metals of 3/16 in. combined thickness. Tips of the unit are easy to replace and adjust.

Also available is a stand into which the welder, weighing only 55 lb, can be mounted for use as a foot operated floor model. *Ross Machine Tool Company, P. O. Box 122, Chicago Ridge, Ill.*

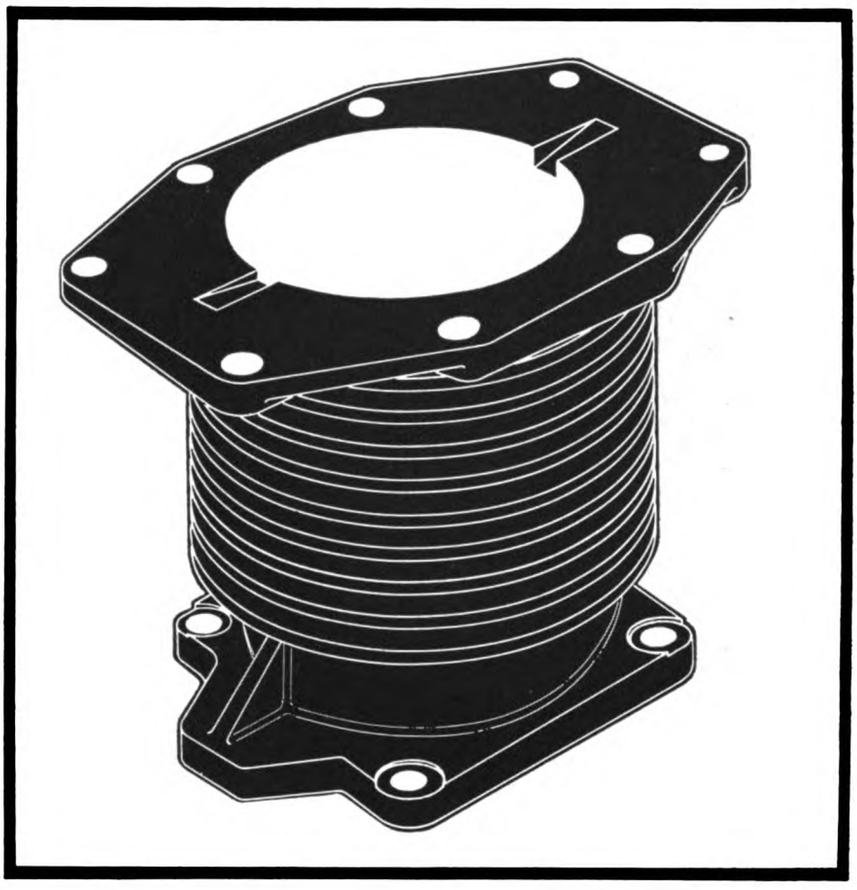


Template Filing Cabinet

The Templa-File contains a total of 24-36 in. by 80 in. numbered sliding panels. Each panel is suspended on rollers operating on roll-formed track. Its capacity is 2880 sq ft and each panel will independently support 600 lb of suspended weight. It provides an orderly system for filing and storing templates, patterns, gaskets and flat tools.

A self-contained record or reference desk folds into the unit when not in use. Attached to the desk is a swing-out tabulat-

A/C Cylinders too!



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The Duff-Norton SK-1683 jack in use for piggy-back service.

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Many leading railroads naturally turned to Duff-Norton when they wanted special jacks to assure safe, economical piggy-back service. Six of the roads already have these Duff-Norton jacks in use. Others are working with Duff-Norton engineers in developing variations of them to suit particular methods of operation.

The men responsible for inaugurating piggy-back service on these roads know that Duff-Norton's long experience in designing and manufacturing jacks for special railroad uses gives them a dependable background for meeting this new situation. That is why the railroads whose trademarks you see here are using Duff-Norton jacks for piggy-back service. To learn more about these special jacks, write today to the Duff-Norton Company, P.O. Box 1889, Pittsburgh 30, Pa. Canadian Plant: Toronto 6, Ontario.

DUFF-NORTON Jacks

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ing file card for ease in locating or filing.

The unit is 9 ft 6 in. wide, 31 in. deep and 7 ft high. Net weight is 1,500 lb. Finish is grey bonderized baked-on enamel. *DeLuxe Metal Furniture Company, 306 Struthers street, Warren, Pa.*

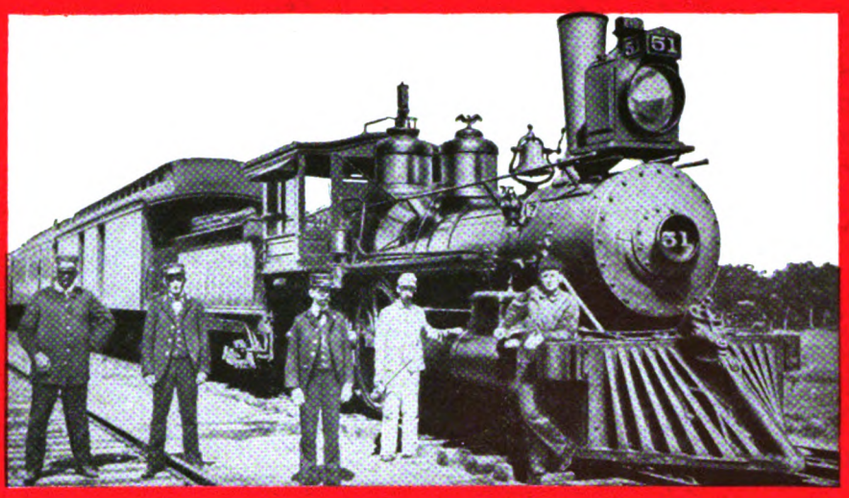
Fire-Preventive Drum Cover

The Thermo-Acting drum cover can convert any used steel drum or standard trash can into a fire-preventive container. It produces a safe receptacle for oily rags, paints, solvents, packing materials, or waste paper. The red-painted cover is a sturdy, snug-fitting steel stamping attached with a special hinge to an adjustable steel band. The band is placed around the upper part of the drum with cover closed for correct positioning. The wing nut on the band is then tightened and the cover raised ready for use. Normally, the cover is open to receive waste materials, held in position by the hinge's spring plunger unit which contains a low melting point fusible link. Should a fire occur inside or outside the can, the fusible link melts, releases the spring loaded plunger, and closes the lid.

The fusible links are quickly and easily replaced. Covers are available to fit 55-gal and 30-gal steel drums, standard trash cans, and 11-in. diameter pails. *Protecto-seal Company, 1920 South Western avenue, Chicago 8.*

Hand Cleaner

A liquid hand cleaner, Rid, is said quickly to remove paint, grease, oil, grime, putty and other stubborn dirt from the hands. It can be used either with or without water. The cleaner contains no abrasives or ammonia, but does contain lanolin and an antiseptic that is reported to remove germs from the skin surface. It is sold in self-dispensing cans of half-pint and pint size. *Fern-Wey Company, 11705 Detroit avenue, Cleveland 7.*



No. 51, a 4-4-0 built by Cooke in 1877, had a splendid record over the turn of the century as power plant for the famed Frisco "Meteor" on the St. Louis-Oklahoma City run. Note the fancy cab and other handsome adornments of this veteran.

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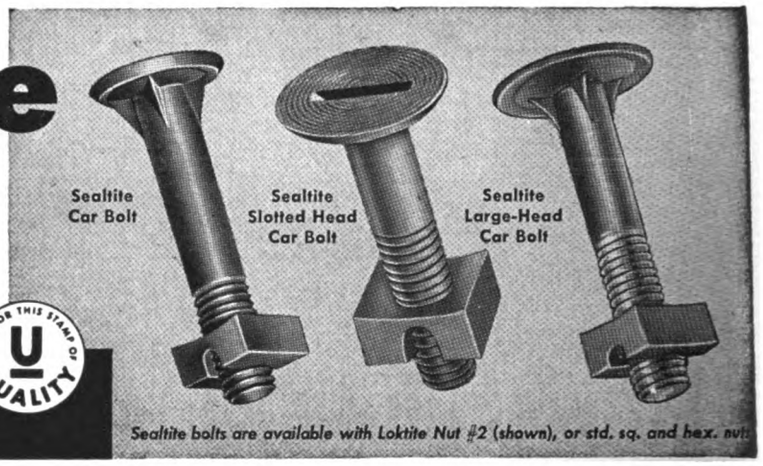
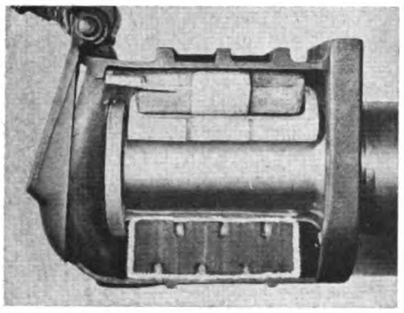


Sealtite bolts are available with Loktite Nut #2 (shown), or std. sq. and hex. nut.



Journal Lubricating Pad

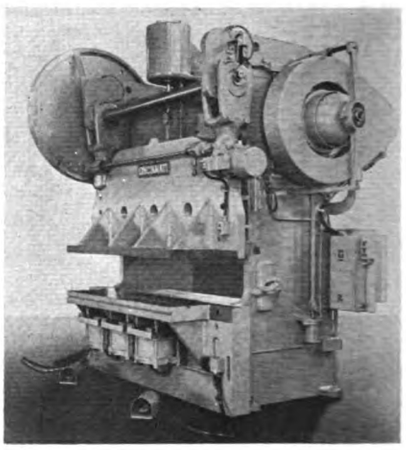
The Redipak is a block of specially processed Neoprene enclosed by heavy cotton wicking material. The capillary action of the open cells in the neoprene and the pumping action produced by a series of holes molded in the top and bottom of the block provide oil feed. Additional oil is brought to the journal surface by the wicking action of the cotton cover which is also claimed to filter out foreign material.

The Redipak is installed by hand and without tools. The top and bottom are identical and the pad is square so that it is claimed this device can not be applied improperly. Ring-shaped grommets at the corners simplify removal because a hook can be used to pull the device from under the journal collar. Laboratory tests are said to prove that this device will operate at higher temperatures and have longer life than waste or felt pads. Life is estimated at about 50,000 miles or three years of service.

Test installations of this device have been in passenger service since 1954. The AAR has given approval for installation of 8,000 of these pads in limited interchange service. This device is made in five sizes for the standard journals from 4¼x8-in. to 6½x12 in. *National Bearing Division, American Brake Shoe Company, St. Louis 10.*

Drill Lubricant

Metalube is a lubricant said to increase tool life and to speed drilling, tapping and reaming operations. Using this material, it is stated that for some applications the holes produced by drilling are so accurate and well finished that no reaming is necessary. It can be used on all metals. Metalube is supplied in tubes, and in cans from pint to 5-gal. size. *Protective Coatings, Inc., Box 3985, Detroit 27.*



Press Brake

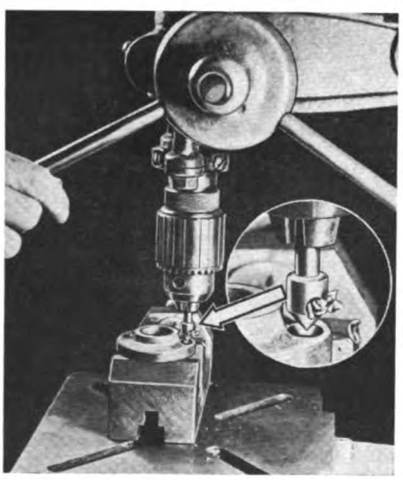
Shallow draw work and various press operations can be done on this all-steel press brake which has a 36-in. wide bed and ram, a shut height of 15 in., and an 8-ft overall die surface. Six 12-in. air cushions are mounted on the underside of the bed, front and back. The two foot pedals operate as a single control, or can be operated separately. An interlocking feature on the foot pedals insures safety, particularly in multiple press operations.

The press brake is driven through an air-electric clutch with automatic stop and non-repeat controls. It has a two-speed transmission with speeds of 13 and 30 strokes per min, and a 5-in. stroke. There is an air counterbalance. Total weight is 17 tons. *Cincinnati Shaper Company, Cincinnati 25.*

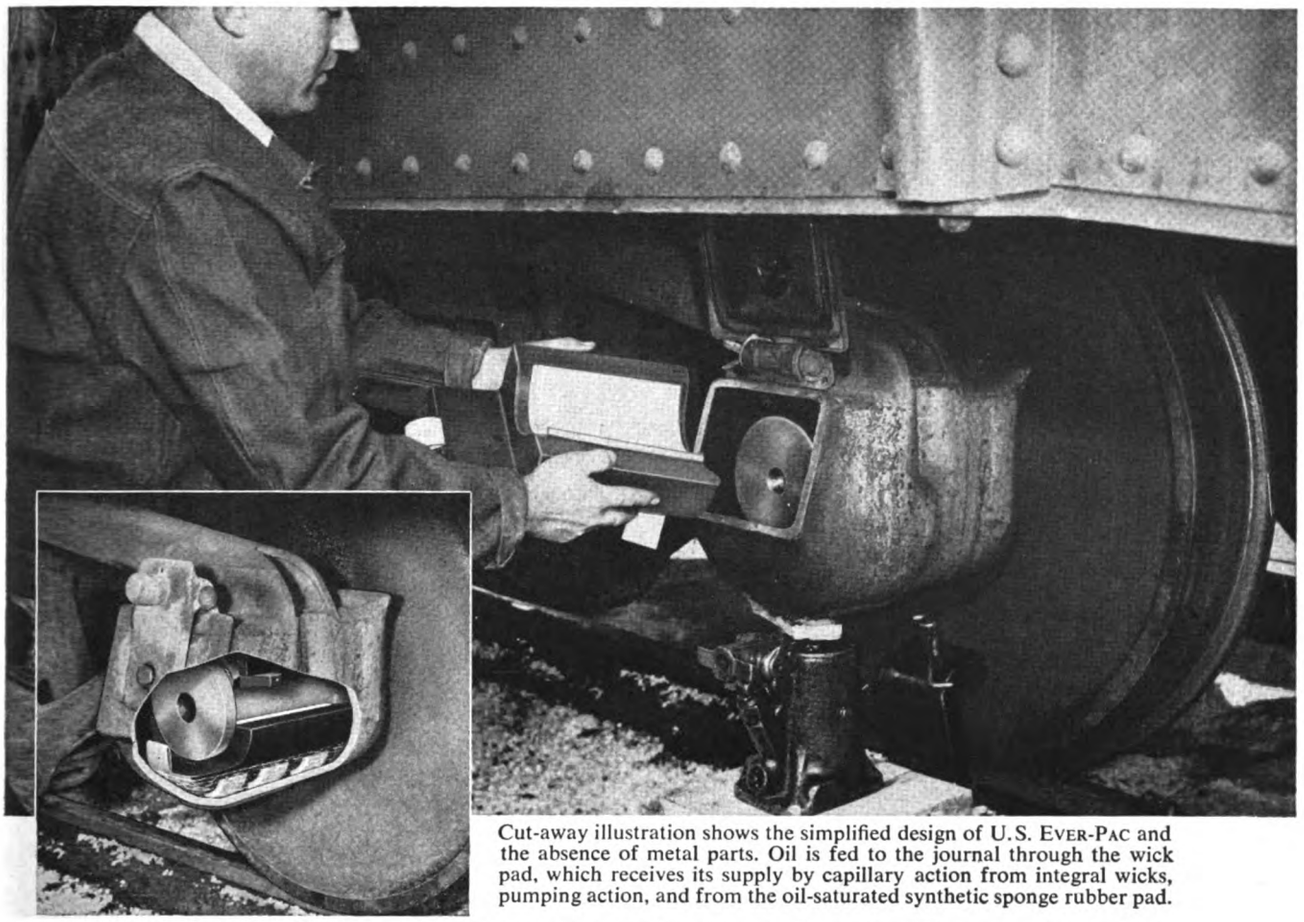
Solid Carbide Countersink

This countersink, fabricated from solid carbide tool steel, has a non-cutting edge that is flattened and is higher than the cutting edge. A round chip clearance hole is centered in the cutting edge to permit a smooth flow of chip waste. Construction is said to eliminate chatter and insure exact cutting in one operation.

The device has an 82-deg included angle and is available for screw size Nos. 5, 6, 8 and 10. Larger sizes, ¼ up to ½ in., can be ordered with or without a pilot to fit any diameter required. Its recommended speed is 250 to 500 rpm. *Raymac Division, Dexco Corporation, 15490 Dale avenue, Detroit 23.*



BANISH THE BIGGEST CAUSE OF HOT BOXES



Cut-away illustration shows the simplified design of U.S. EVER-PAC and the absence of metal parts. Oil is fed to the journal through the wick pad, which receives its supply by capillary action from integral wicks, pumping action, and from the oil-saturated synthetic sponge rubber pad.

with the new, proven U. S. EVER-PAC*

Here at last is the Journal Lubricator that meets the railroads' chief demand:

Makes "waste-grabs" and other failures of waste packing impossible!

No costly special oil seals required!

Interchanges with present equipment!
(No shop modifications, machining or additional labor costs)

Low-cost initial installation!

Easy determination of oil level!

Low-cost upkeep!

Trouble-free service!

71% of hot boxes are directly attributable to waste packing, mostly "waste-grabs." Ever-Pac makes "waste-grabs" impossible!

U. S. Ever-Pac has A.A.R. approval for application to a specified number of cars which move in general interchange service (Docket No. L-129).

Years of intensive research and testing show conclusively that with U. S. Ever-Pac, a product of United States Rubber Company, a major cause of hot boxes can now be eliminated.

EVER-PAC GIVES FULL 3-WAY OIL SUPPLY, MILE AFTER MILE. The reservoir on its underside holds 2 pints of oil, and the sponge rubber pad holds 2 pints more—2 full quarts of oil at all times. Plus 3-way oil delivery:

(1) *Capillary action soaks up oil.* The hungry wick is oil-absorbent. The yieldable sponge rubber, a specially developed synthetic compound, provides a cushioned *upward* contact at all times, providing a controlled rate of *clean* oil distribution.

(2) *Pumping action.* Each vertical or lateral movement of the journal or journal box compresses the pad, thereby setting up a pumping action which pumps oil from the reservoir under the pad through holes to the distributing wick pad.

(3) *Sponge pad flexing.* Each movement of the journal or journal box flexes the *yielding* pad and makes the pad "breathe out" *even more oil*—because the pad retains 2 pints of oil *above and beyond* the amount of oil in the oil reservoir.

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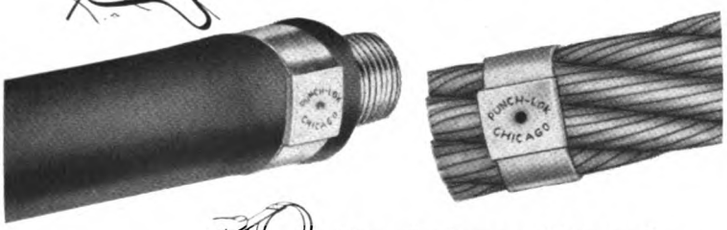

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Fastening hose or seizing tough wire rope—Punch-Lok clamps do the jobs with equal facility!

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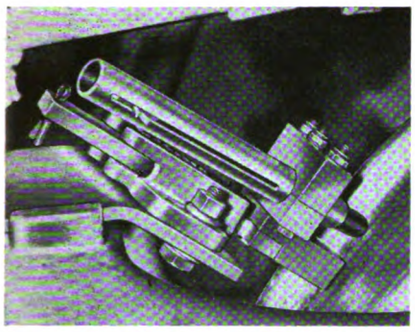
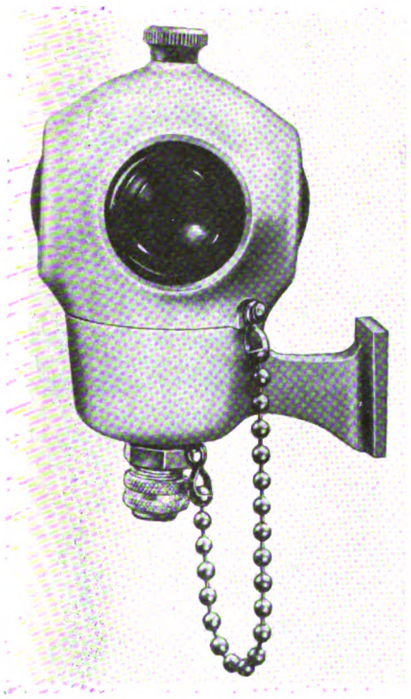


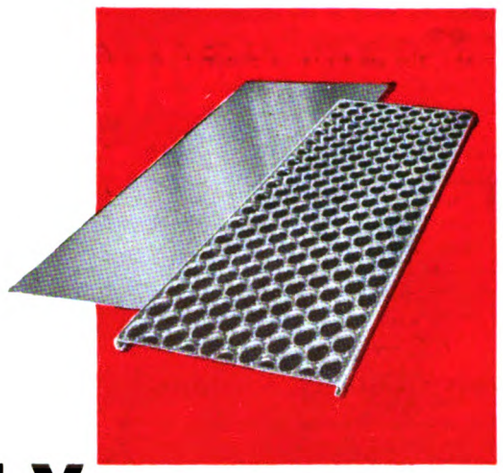
Flange Lubricator

This flange lubricator uses dry molybdenum-disulfide stick-type lubricant and has a guide shoe which keeps it aligned with the wheel. It has four parts—the housing, slide bar, stick tube, and guide shoe. There are no springs or regulating mechanism requiring adjustment. The molybdenum-disulfide is said to provide high-film-strength lubrication which does not pick up dirt or other abrasives. It is also said that there is no track fouling or traction losses. *National Aluminate Corporation, 6216 West 66th Place, Chicago 38.*



Marker Light

The Midget marker light was designed for general rear-of-train and locomotive use and particularly for cabooses with low-voltage electric systems. Only one-third normal size and lighter in weight, this marker is said to have greater beam intensity and better visibility than standard markers. The light has an integral mounting bracket that fits standard AAR holders and is adjustable to any angle. Color aspects are changed by loosening the self-retained knurled thumb screw at the top



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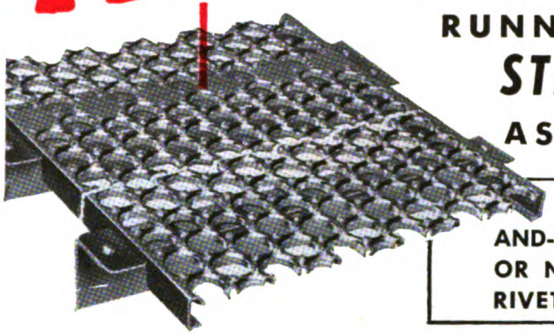

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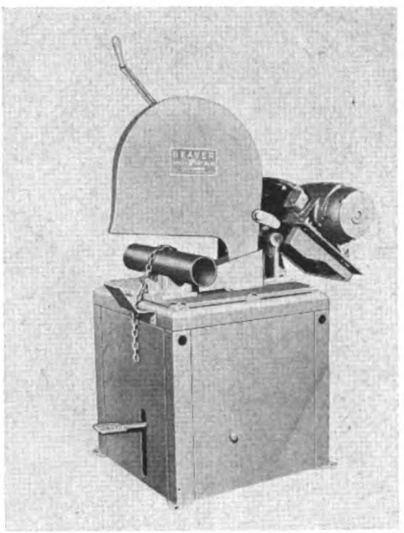
and turning the hood to the desired color position. By completely loosening the thumb screw, the hood can be removed to change the double-contact bayonet-base clear lamp, or to work on wiring or the receptacle. A heavy beaded chain holds the hood to the base while it is removed. Lenses are held in the hood by molded snap-in gaskets. A rubber O-ring is used for the weatherproof seal between the hood and the bracket base. A rubber bushing cord grip is furnished at the bottom for the entry of the cord. *Pyle-National Company, 1334 N. Kostner avenue, Chicago 51.*

Abrasive Cutting Machine

Speed-Cut, an abrasive cutting machine, is designed to cut all shapes and types of materials. The high speed abrasive wheel is said to cut hard or soft materials with ease, and the cut surface is said to be so smooth that it seldom needs further finishing. The machine has a quick-acting, foot-controlled chain vise that holds even irregular shapes immovable during the cutting operation with only slight pressure.

A welded steel wheel guard completely shields the wheel at all times. This guard attached to the balanced one-piece tilting table, rests on a heavy gage metal shield, giving extra operator protection during cutting. The machines have permanently sealed double-row ball bearings. Two sizes are built. The No. 20, with a 20-in. abrasive wheel running at 2,300 rpm, can

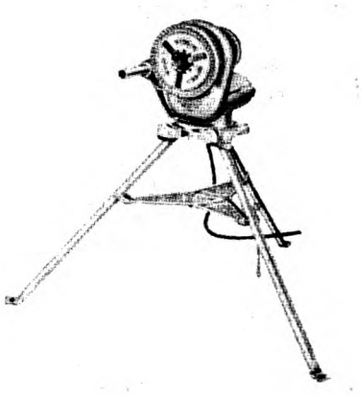


cut a 6-in. pipe or a 2½-in. solid round or bar. The No. 14, with a 14-in. wheel running 3,000 rpm, can sever 4-in. pipe or a 2-in. solid rod or bar. *Beaver Pipe Tools, Inc., Warren, Ohio.*

Tripod Power Drive

Hand pipe tools can be power-operated with this small, lightweight power drive on a folding tripod. The legs and integral tray fold up compactly and can be chained in this position. It can then be carried by the built-in handle on the power unit. There is no leg at the front to interfere with the swing of the die stock handles.

The power unit has a motor of special



design and uses the Ridgid speed chuck which is quickly opened or closed with a handwheel. A centering device at the rear automatically centers and holds pipe. The power unit is also equipped with pipe benders and slots for hanging tools. The capacity of the Ridgid No. 200 is pipe from ⅛-in. to 2-in., and ¼-in. to 2-in. bolts. *Ridge Tool Company, Elyria, Ohio.*

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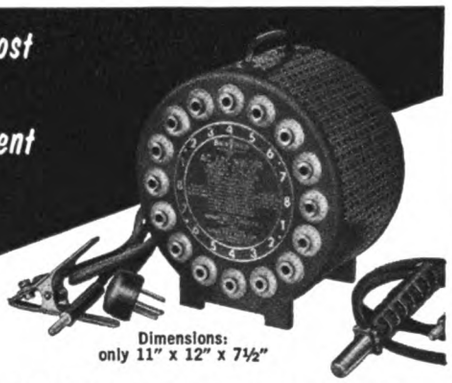

Dimensions: only 11" x 12" x 7½"

BREN-WELD MODEL 200 AW

Weighs only 65 lbs.— Carry it to the job!

Patent Pending

FIRST TRULY PORTABLE 200 AMP. OUTPUT ARC WELDER

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Simple to use, fully guaranteed, it operates on 110/220 volts AC, 50/60 cycles; handles electrodes from 3/64" to 5/32". Has adjustable arc voltage for different arc characteristics. Ideal for plant production and maintenance, for construction work, railroads, on the farm or home.

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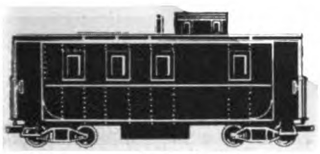
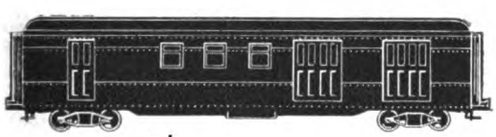
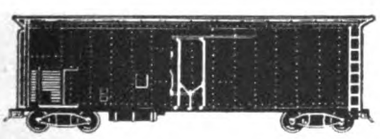


TWO-WAY RADIO



LIGHTING EQUIPMENT



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The new, small ½ to 5 KW Spicer ***Positive Gear*** Generator Drive makes available to caboose, baggage, refrigerator, and mail cars, all the advantages of steady, ample electrical current.

And the new Spicer Drive delivers the power for this ½ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer ***Positive Gear*** Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lighting, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

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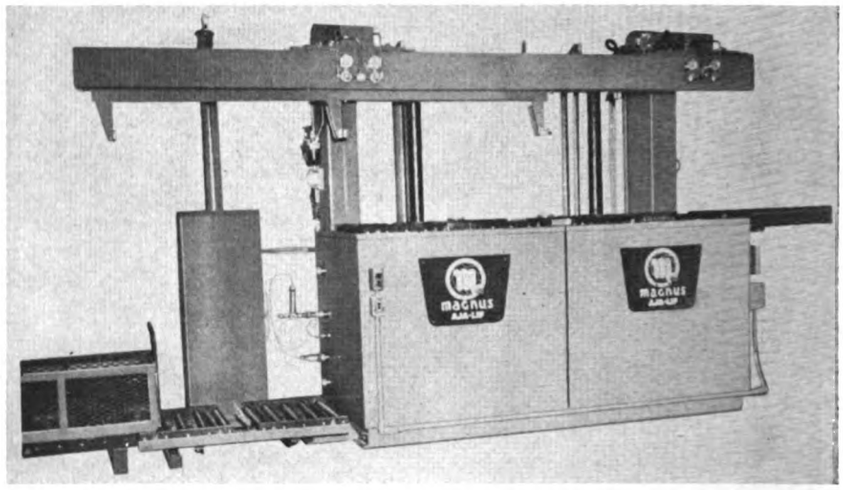
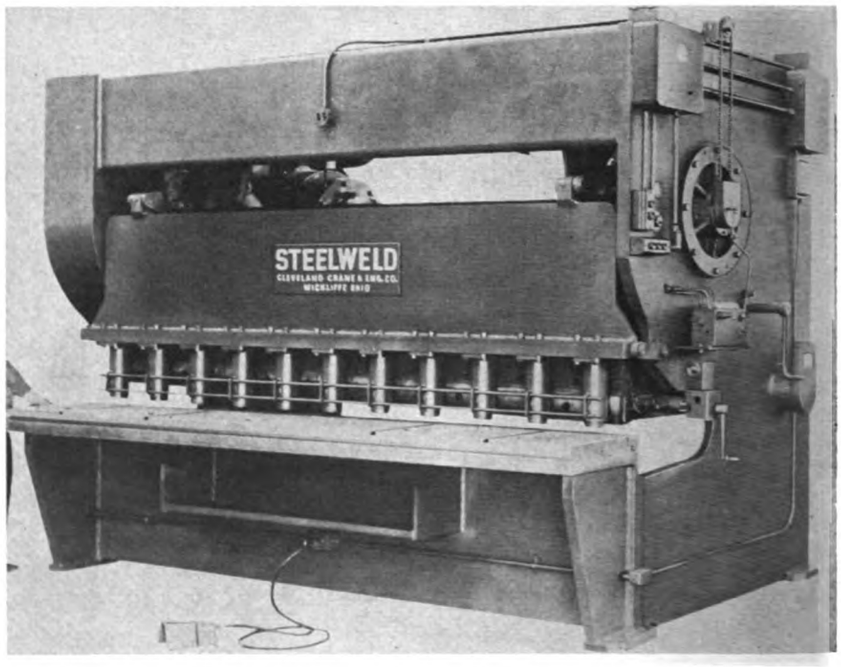


Mechanical Agitation Cleaning Machine

This air powered "Aja-Lif Automatic" is equipped with a "nu-matic push device" and "air lift loading." The work to be processed is pushed at floor level onto a lifting roller platform which automatically raises the work to the top of the cleaning machine. At the same time similar roller platforms in each tank rise to the same level. Then a pushing device with collapsible dogs transfers each batch of work one step forward at each cycle.

A timing device, synchronizes the drive unit with the loading unit. The platforms in each tank are lowered in the cleaning solution and agitated for a period of time, after which the platforms automatically rise again. At this moment the "nu-matic push drive" transfers the baskets one more step and the process repeats itself indefinitely.

The unit can be designed for any number of operations and for use with solvents, alkalies, or acids. It requires no special foundation. *Magnus Chemical Company, Inc., Garwood, N.J.*

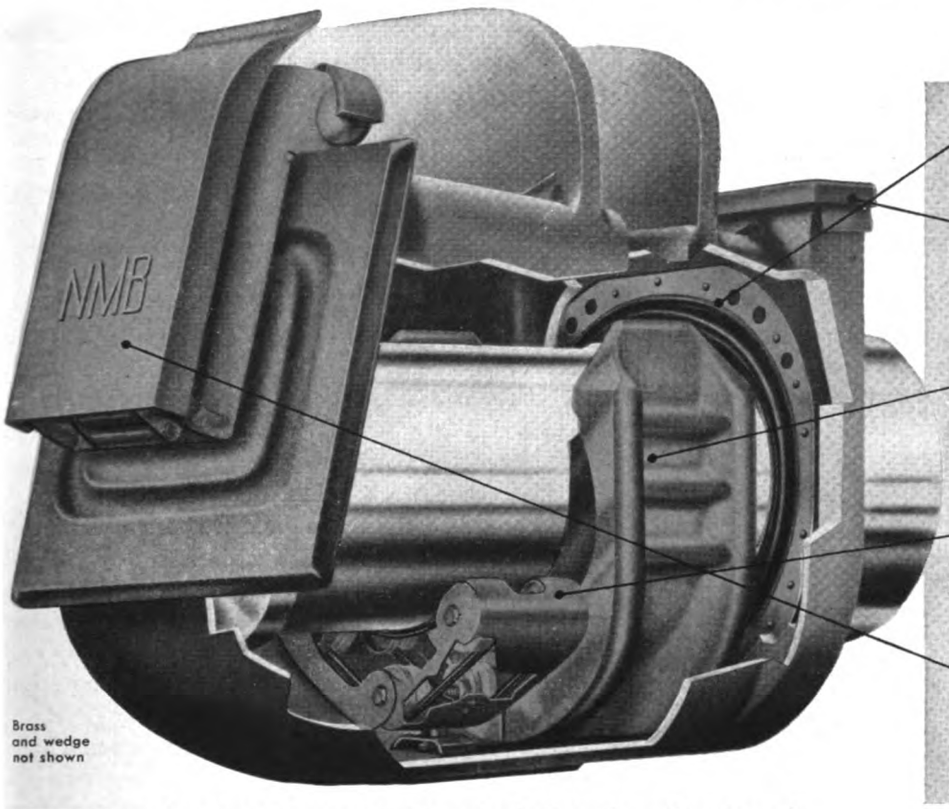


Shear

The Steelweld Shear will cut mild steel up to 12-ft x ½-in. It operates on a pivoted-blade principle—the blade travels in a circular path without the use of guides and sliles common with guillotine-type shears. It is clamed that this eliminates a source of wear and shearing inaccuracies. The shear has a cool running air-operated clutch and brake that are said to be fast and positive acting. A Micro-set knife adjustment makes possible a simple, rapid adjustment of knife clearance to suit the thickness of the metal being cut. The press can be controlled by an electric foot switch that is moved around the floor to the spot most convenient for use. *Steelweld Machinery Division, Cleveland Crane & Engineering Co., Wickliffe, Ohio.*

NMB Lubricating System uses "long" solid bearings; is quickly installed without journal box alteration

A.A.R. APPROVED FOR INTERCHANGE SERVICE ON 10,000 CARS



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B. DUST GUARD WELL COVER and FILTER. Exclude dripping water, snow, brine; yet permit breathing.

C. JOURNAL GUARD BEARINGS. Eliminate axle damage during humping, coupling, starting or heavy braking.

D. OIL CIRCULATOR. Lubricates bearings with ½ turn of axle. Guarantees continuous lubrication. Bearings run 50° cooler.

E. JOURNAL BOX LID and WAFFLE GASKET. Provide tight oil and water seal at front opening. Eliminate vibration wear.

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Installation is made in the standard A.A.R. journal box. No alteration is required. Waste packing formerly used for lubrication is eliminated (no waste grabs). NMB Systems for 5" x 9", 5½" x 10" and 6" x 11" A.A.R. standard solid bearing journal boxes can be shipped promptly.

* Based on operating experience of major Class I railroads
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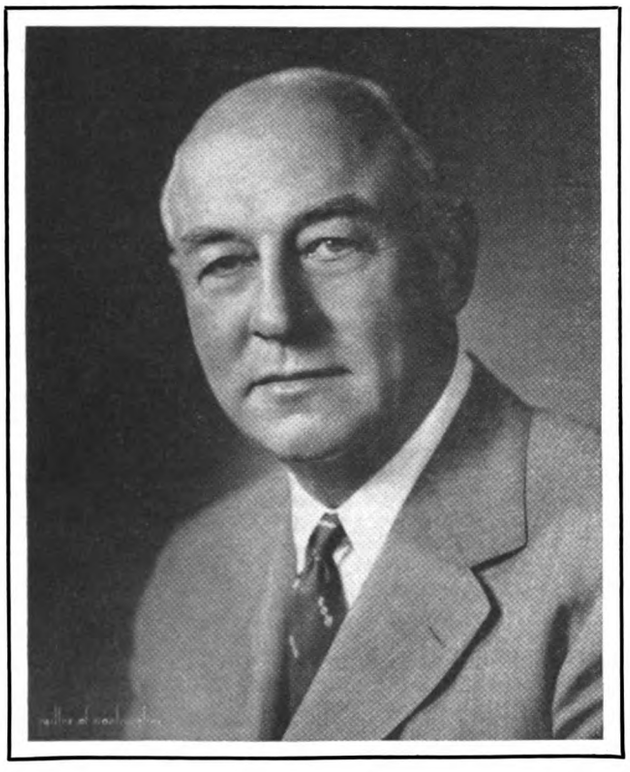
AN IMPORTANT MESSAGE FROM THE SECRETARY OF THE TREASURY

A THREE-WAY PARTNERSHIP THAT BENEFITS EVERYBODY

How the public, the magazine publishers and the U. S. Government cooperate to help keep the nation's economy growing always stronger

As a reader of this magazine, the chances are that you belong to a "three-way partnership" dedicated to intelligent saving and a sound economy. For you probably buy United States Savings Bonds. Nearly 40 per cent of the families in America own them. Most Bond-owning families have saved enough in this way to pay for a serious illness, to provide something for old age, to make a down payment on a house or take a long trip. And perhaps most important, these families have the wonderful feeling of security that the ownership and holding of these Bonds bring.



Americans today are buying Savings Bonds at an annual rate of more than $5,000,000,000. In the time it takes you to read this page, approximately one minute, America will buy $10,000 worth of Series E and H Bonds!

How, you may ask, did this come about?

It came about through a great program of voluntary cooperation with the Treasury Department on the part of many groups, organizations and citizens. The magazine publishers have from the beginning been among the major supporters of the Bond program. They contribute millions of dollars' worth of advertising space each year.

Full credit for making Bond-buying a national habit is due that "three-way partnership"—the American citizen, the Government, and the volunteer groups, such as the magazine publishers, who bring buyer and seller together through the pages of their publications.

All three partners will profit further by continuing to help increase the nation's saving through the sale of Savings Bonds.

For so effectively promoting the national welfare I wish, on behalf of the Government, to extend to the magazine publishers our most sincere thanks.

Secretary of the Treasury

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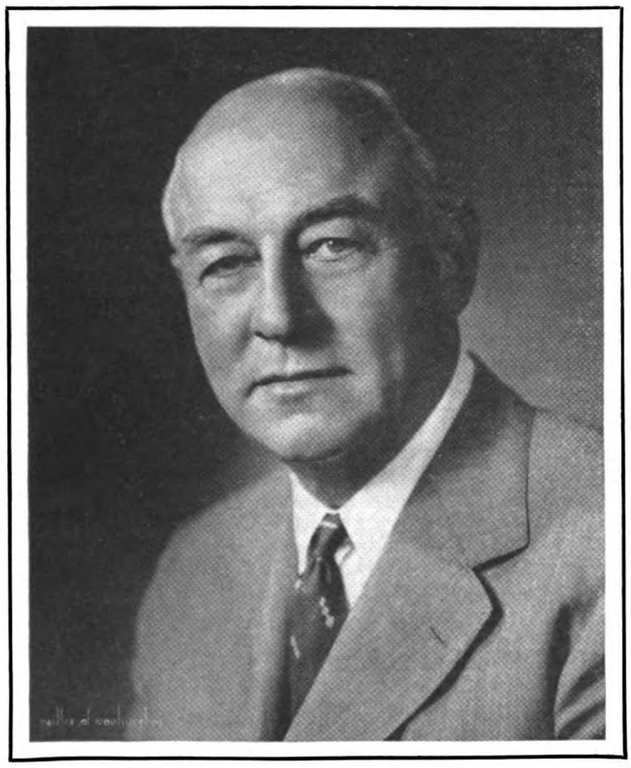

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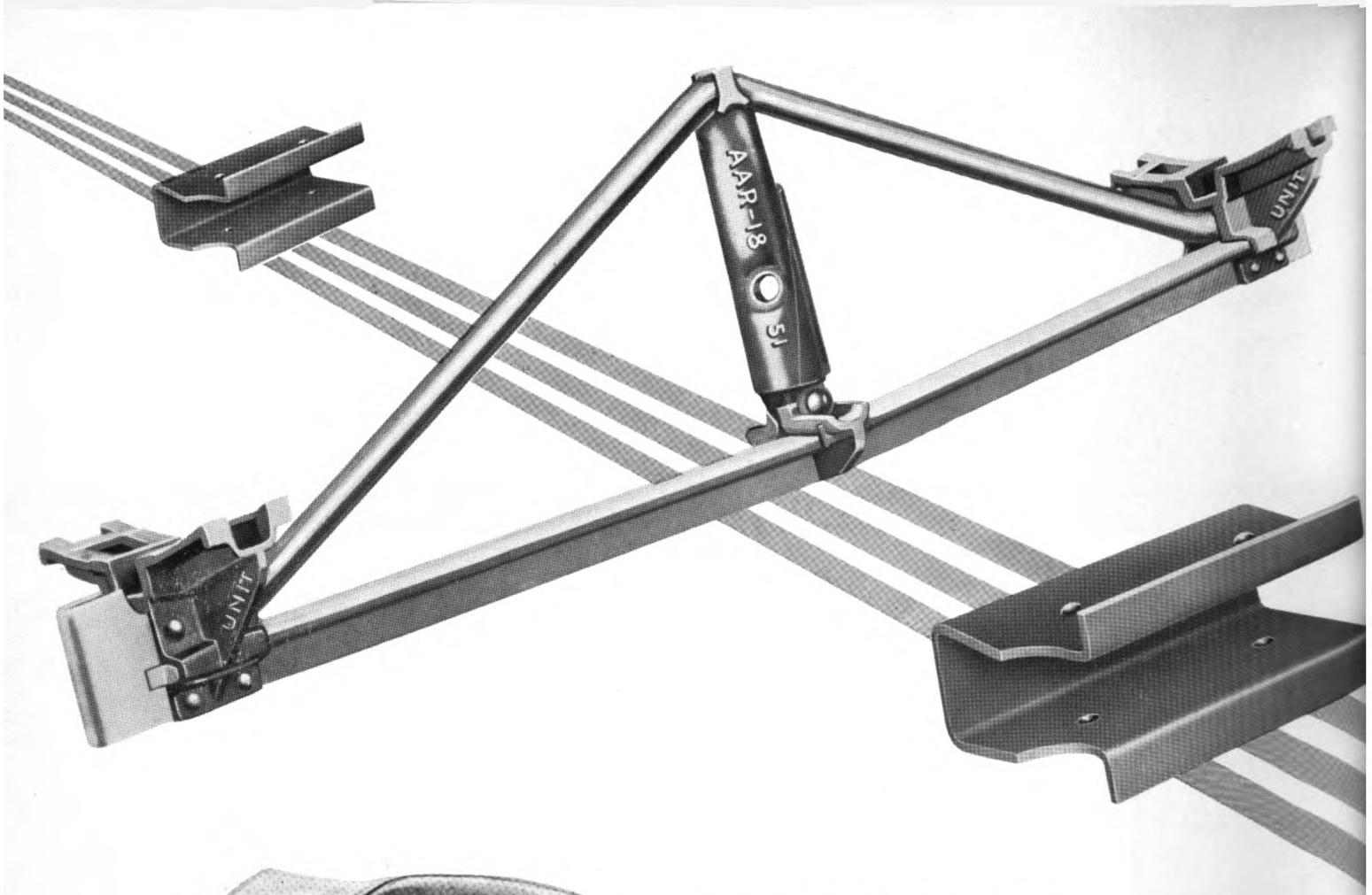

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

OCTOBER, 1955 - VOLUME 125, NO. 10

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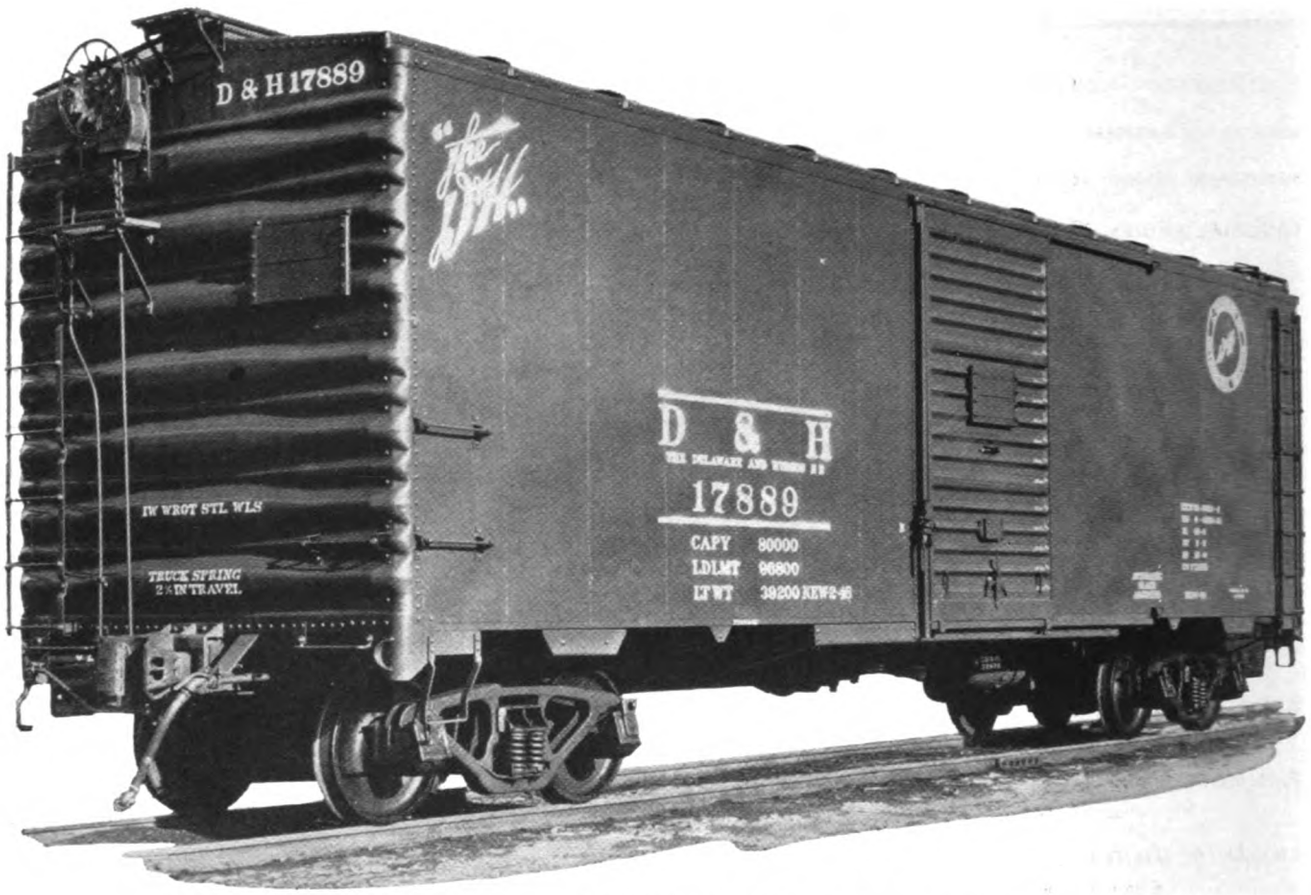

Resists corrosion, abrasion, impact. Underframes and sides of this Delaware and Hudson boxcar are made of Mayari R, a high strength low alloy steel containing nickel, produced by Bethlehem Steel Co., Bethlehem, Pa. This type of nickel steel readily responds to usual fabricating operations, including forming and welding. Its high strength, as-rolled, permits reducing deadweight or increasing safety factors

Car's capacity raised to 97,000 pounds by using alloy steel to cut deadweight

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Deadweight per car is cut to 39,000 pounds . . . by designing to use underframes and sides made of a high strength low alloy steel containing nickel.

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Naturally, with lengthened ability to withstand battering, abrasion and shock, use of cars made of these nickel alloy steels not only minimizes maintenance work, but also gives the user maximum return per dollar invested.

Moderate in cost, high strength low alloy steels containing nickel along with other alloying elements are produced under a variety of trade names by leading steel companies.

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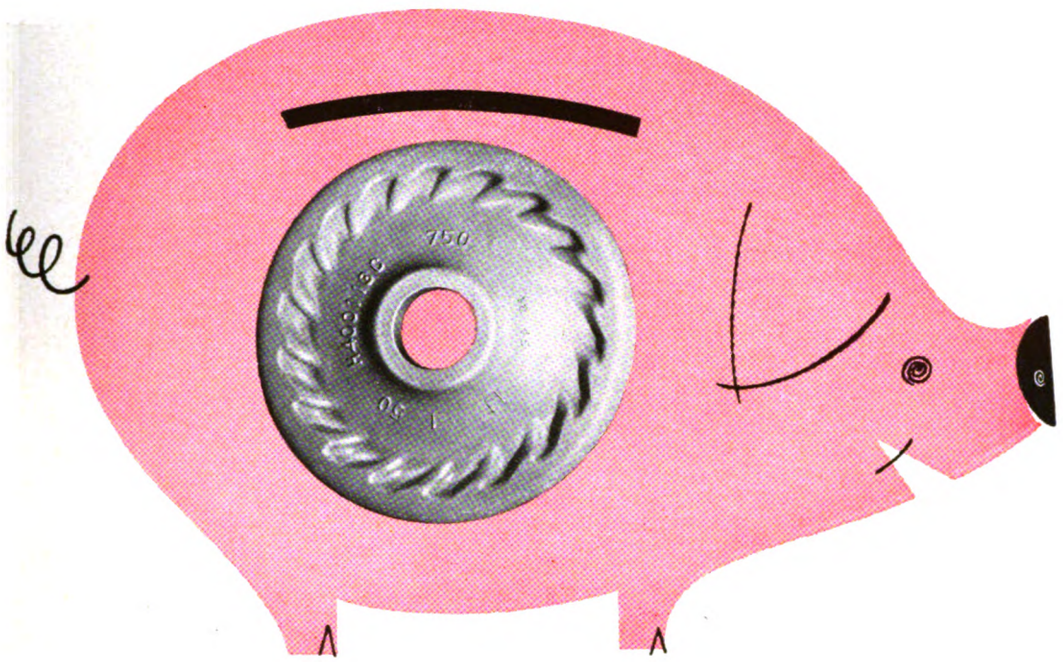

Production of chilled car wheels in 23 cities throughout the U. S. assures quick, low-cost delivery from AMCCW plant near you.

When you order AMCCW chilled car wheels, you get the benefit of short-haul delivery...which means you get the wheels sooner, pay less freight charges. Means you can make a small inventory do the job of a larger one, too.

When the wheels arrive you find they bore faster, are easier on cutting tools, and require less pressure for mounting.

And when, after longer-than-ever, safer-than-ever mileage the wheels finally wear out, you have the same short haul to the nearest AMCCW plant, where low exchange rates keep replacement cost to the very minimum.

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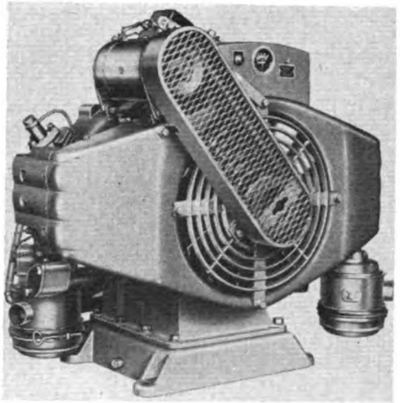


Air-Cooled Diesel Engine

Model DRP is a 4-cycle, air-cooled, solid injection full diesel engine. It is rated at 15 hp, corrected bhp with accessories, at 2300 rpm. The opposed two-cylinder design is said to provide smooth running operation, and air cooling eliminates the need to maintain radiator, fan belt, etc.

The engine has a 3½ in. bore, 3½ in. stroke and a 67.3 cu in. piston displacement. Compression ratio is 17.3-1. The unit weighs 516 lb. Crankshaft and connecting rods are of forged steel, with large bearing surfaces. A 12-volt battery charging generator and 12-volt electric starter are supplied as standard equipment. Other accessories include a throttle lever template, timing gauge and instruction manual. *D. W. Onan & Sons, Inc., University Ave. S.E. at 25th, Minneapolis.*

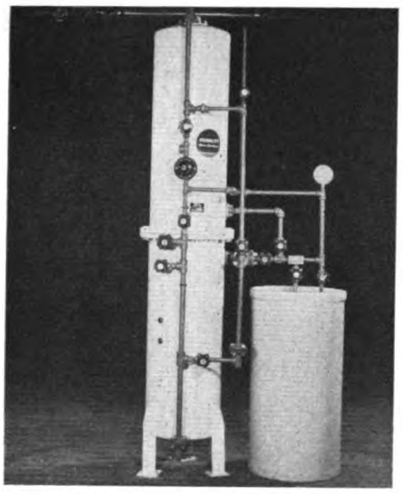
Marking Ink

A fast-drying ink in a package applicator marks on rough or smooth surfaces such as castings, bar stock, machinery, tools, dies, glass, wood or plastic. The ink, it is said, will not readily chip, peel or be affected by heat or weathering.

The ink is packaged in a burst-proof tube fitted with a smooth acting ball point. Different size ball points and seven standard colors are available. *John P. Nissen, Jr., Company, Glenside, Pa.*

Safety Spectacles

Optilite when used in safety spectacle lens is said to give more comfort, better appearance, and greater protection than safety glass lenses. It is a lightweight, transparent lens material of compounded resins. Weighing only half as much as safety glass, this material is said to have twice the strength of the same thickness of safety glass. The material in a series of tests, underwent high impacts without shattering. *United States Safety Service Company, Kansas City 6.*



Mixed-Bed Demineralizer

The Model MBD-15 Demineralizer is for the demineralization of relatively small quantities of water—up to 360 gal per hr. It is a compact unit which contains a resin bed consisting of a mixture of cation exchangers and anion exchangers. It will produce a water of low total dissolved solids, low carbon dioxide, low silica content and extremely low conductivity.

Treated effluent from the unit will have an average conductivity of 0.15 microhms, equivalent to approximately 6,000,000 ohms/cm specific gravity or 0.05 ppm total electrolyte content. Flow rate is 6 gpm average to 7.5 gpm maximum. It has a kilograin capacity of 24,000 grains total dissolved solids. The tank, containing 5.4 cu ft of resin, is 15 in. in diameter, 7 ft 7 in. in overall height, and is protected with 6 coats of Heresite lining. The resin bed is regenerated with 12 lb of sulfuric acid for the cation exchanger and 20 lb of caustic soda for the anion exchanger. *Permutit Company, 330 W. 42nd street, New York 36.*

Ladder Leg Extensions

Ladr-Levl, a safety device easily attached to wooden or steel ladders, has self-adjusting legs that adapt themselves to any terrain, no matter how uneven. The ladder can stand upright, and it is said that the nonskid, swiveling feet prevent any slipping. There is sufficient adjustment to accommodate standard 9½-in. stairway risers.

When the user puts his weight on the first ladder rung, the mechanism locks automatically in place, and can be unlocked only by hand. The weight of the ladder is always directed down along the side rails and lateral stresses are said to be eliminated. Installation of this device is reported to be simple, and it can be transferred from ladder to ladder. Ladr-Levl is made of an aluminum alloy, withstands a 1,000-lb ladder load test, and weighs 5 lb. *H-B Industries, Inc., 1401 Middle Harbor Road, Oakland, Cal.*

Packaged Toilet Units

Totally packaged toilet and washroom units fabricated largely of impervious stainless steel provide complete toilet accommodations in minimum space. Each Travel-Lav, as these units have been named, is said to have the size and engineering that offer great freedom in laying out plumbing for roomettes and bedrooms on new and rebuilt cars.

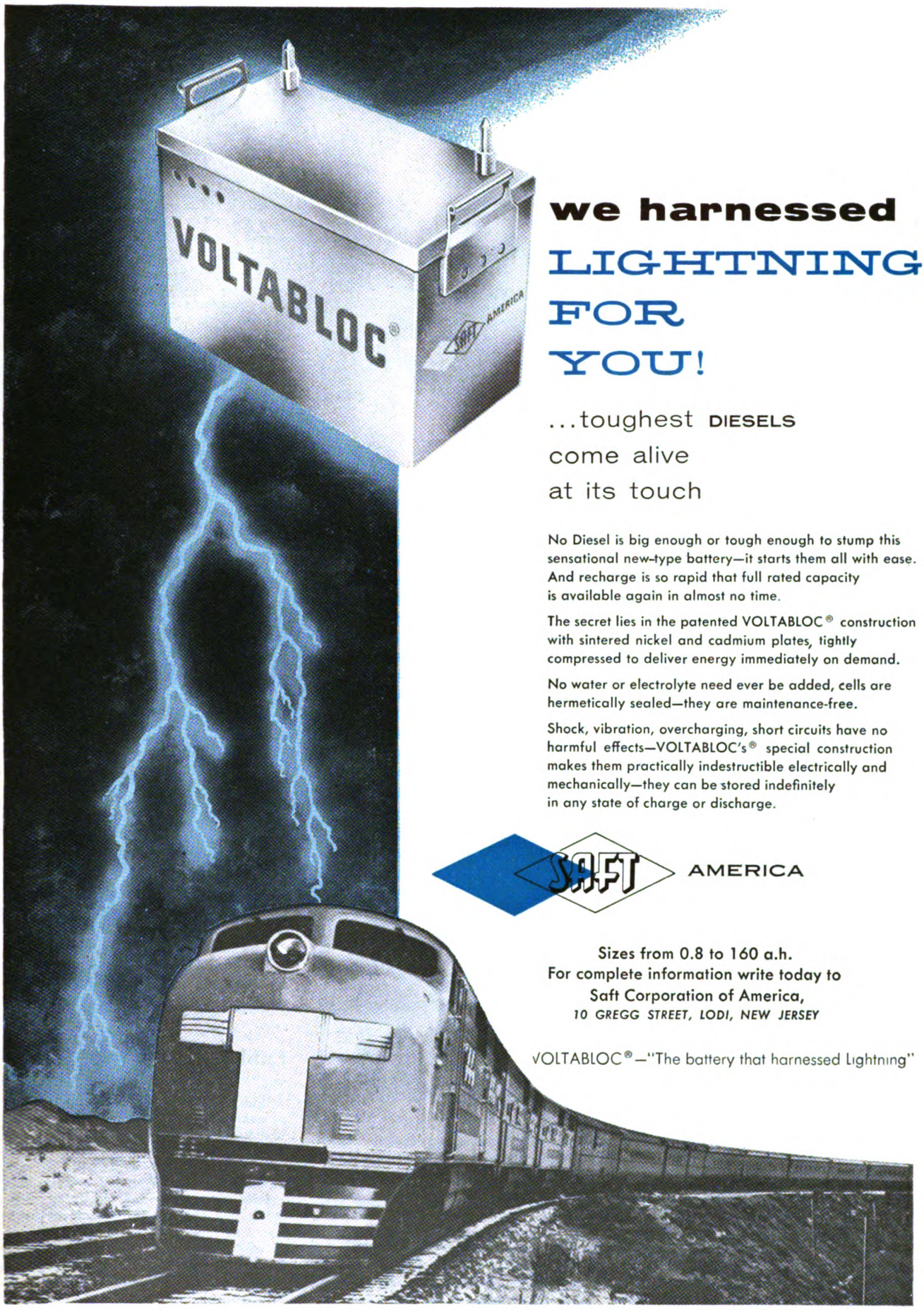
Both the wash basin and toilet make use of the same floor space, each being arranged to fold away when not in use. Machined parts have been designed for foolproof operation, and the unit's design mechanically and structurally is said to meet the highest sanitation requirements. Provision is made for servicing every component of the unit. Each Travel-Lav is shipped as a complete assembly ready for the hook-up of water and waste lines, and each can be supplied in stainless, gray hammered, or primed finish. Towel and cup dispensers, soap dish, mirror and lighting are provided in the various models.

The smallest unit occupies a floor area of 8½ x 20-in. A unit with a shower fits a space 21½ x 39-in. *Angelo Colonna, Westmoreland and Boudinot streets, Philadelphia.*

Balancer for Flat-Car Trailer Bridge

A balancer for the trailer bridges used on piggy-back flat cars uses torsion-spring bars which are mounted and operated like those that balance the ends of drop-end gondolas. The bars are secured at their inner ends in a trunnion-and-spring anchor mounted on the end sill of the car. The trailer bridge is built out from a 3½-in. o.d. tube

(Continued on page 10)



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(Continued from page 6)

which contains the spring anchor securing the outer ends of the two torsion bars. The bars run the length of this tube and have an overall length of 4-ft 5-in. It is said that they facilitate the operation of the trailer bridges. *Wine Railway Appliance Company, 2237 Waterworks drive, Toledo 9, Ohio.*

Valve Guide Cleaners

These wound-in-wire nylon valve guide cleaners are said to remove all sludge and varnish, even from hard to reach oil grooves. In addition, they polish and burnish with no possible danger of scratching. There are 10 different sized cleaners, ranging from ¼ in. to 1-1/16 in. They are designed to fit all engines in popular use today. For identification, sizes are marked on the shank. Sizes, 5/16, 11/32, and ⅜ in. are packed in a transparent plastic pouch. *Black & Decker Mfg. Co., Towson 4, Md.*

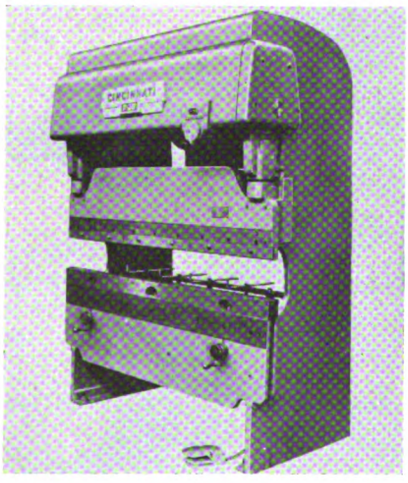
Chemical Cleaning Compounds

Low toxicity, high flash point, and noncorrosive properties feature this series of solvents for railroad maintenance. Safe-Tee solvent FO 128 is a substitute for carbon tetrachloride. It is said that this preparation will not attack insulation or damage delicately machined surfaces. FO 106 is a solvent emulsion type cleaner for exterior car cleaning and the degreasing of locomotive parts, engines and shop pits and floors. FO 106 is diluted for use. Heavy-duty cleaning and degreasing are done with FO 116. Underbodies, running gear and surfaces subjected to heavy oil, asphalt and other stubborn accumulations are cleaned with this material. A hot-dip carbon remover, FO 102, was developed to remove binding gums, oils and other surface deposits from pistons, piston rings, fuel pumps and engine assemblies. *Fine Organics, Inc., 211 East 19th street, Dept. MD, New York.*

Packaged Gear Lubricant

The Jet Lube Poly-Bag, a polyethylene plastic sack containing Sinclair Jet Lubricant, can be dropped into diesel locomotive traction-motor gear cases. The transparent container holds a pound of grease in an easy-to-handle 8⅛x3½ in. size, which eliminates measuring or weighing before application.

The package design, it is said, simplifies servicing. All the maintenance man has to do is drop the Jet Lube into the gear case and the job is completed. When the gears mesh in motion, the bag disintegrates and becomes part of the grease mass. Tests by railroads have shown labor cost savings. *Sinclair Refining Company, 600 Fifth Avenue, New York.*

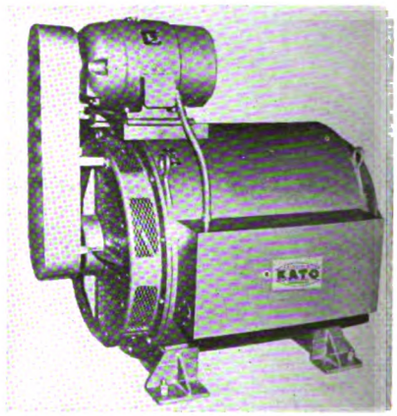


All Steel Press Brakes

Two press brakes, 2-30 Series and the 3-50 Series, are designed to answer the need for light capacity brakes.

The 2-30 brake has a capacity of 30 tons and will bend 6 ft of 14 gage mild steel. It has a distance between housings of 5 ft 2 in. and an overall die surface of 6 ft. Horns can be added to increase overall die surface. The unit has a 2½ in stroke, a 9 in. gap and a 4 in. manual ram adjustment. Power adjustment is available as a special feature.

The 3-50 Series has a capacity of 50 tons and will bend 6 ft of 10 gage mild steel. This series is built in two sizes and has an overall distance between housings of 6 ft 6 in. or 10 ft 6 in. and an overall die surface of 8 ft or 12 ft. Horns can be added to either model to increase the overall die surface. This unit has a 3-in. stroke, a 5-in. power adjustment to the ram as standard equipment and a 12-in. gap. *Cincinnati Shaper Company, Hopple, Garrard and Elam streets, Cincinnati 25.*



Electric Generator

A series of a-c generators range up to 500 kva have been made available. The Model 92BROR unit, rated at 500 kva, 400 kw, 3 phase, 60 cycle, 1200 rpm, 220/440 volt, features an overhead belted exciter. It is also available with a direct connected exciter. Its frame is of heavy welded steel construction with endbells of cast iron.

The generator is also manufactured in a single bearing design, adaptable to standard SAE bell housings. The frame size will accommodate generators from 150 through 300 kw at 900 rpm and also from 200 to 450 kw at 1800 rpm. Standard voltages are available at 2300 volts. *Kato Engineering Company, 1415 First street, Mankato, Minn*

Cable Vulcanizer

This electrically operated cable vulcanizer, weighing only 16 lb less molds, is capable of making repairs on cable up through 2 in. in diameter. It is available for use on standard ac and dc voltages with a wattage rating of 1000, and is designed to make on-the-job jacket repairs or to completely replace insulation and jacketing when splices are required. Aluminum molds for use with the device have been developed to cover most standard and many special types of cord and cable. *Joy Manufacturing Company, Henry W. Oliver Building, Department C-58, Pittsburgh 22.*

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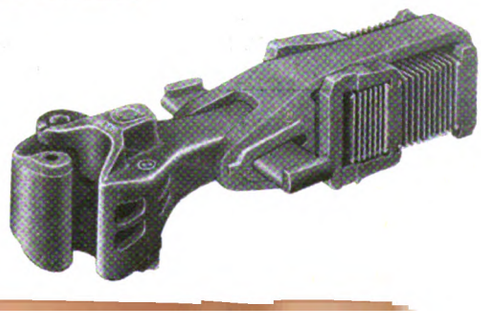

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NEWS

Shop Construction

Chesapeake & Ohio.—Plans and specifications are being prepared for expansion of diesel shops at Russell, Ky. The work, expected to cost approximately $400,000, will add about 50% to the capacity of present diesel repair and maintenance facilities. It is being undertaken in view of the enlargement in the C&O's diesel fleet which will result from receipt later this year of new locomotives now on order.

Chicago & Illinois Midland.—A diesel shop building costing $194,250 is under construction at Springfield, Ill.

All But 2% of Diesels Were Built Since 1940

More than 98% of the diesel-electric locomotives in service on Class I roads at the end of 1954 were built in the last 15 years.

According to an article in "Transport Economics," published by the Bureau of Transport Economics and Statistics, Interstate Commerce Commission, more than 54% were built in the five years ended in 1954.

The report states that there were 23,531 diesel-electric locomotives on Class I roads at the end of last year as against only 8,650 steam locomotives. This compares with 37,551 steam locomotives in service at the end of 1946 and 4,441 diesel-electric locomotives at that time.

Of the steam locomotives in service December 31, 1954, only 4.4% were built in the 10-year period ended then, 75.4% were built before 1930, and 25.9% were built before 1915. Under 1% were built since 1950. Of the diesel-electrics in service at the end of last year—amounting to 71.6% of the total of all locomotives in service—10.8% were built in the 1940-1944 period and 33.1% during 1945-1949.

The report also states that of 656 electric locomotives in service at the end of last year—representing 2% of all locomotives—about 85% were constructed before 1940.

Additionally, the report shows, the tractive effort of the various types of locomotives—measured in millions of pounds—has corresponded very closely to the numbers of locomotives in service.

Where steam locomotives accounted for 87.6% of locomotives in service in 1946, they supplied 87.1% of the tractive effort at that time. At the end of 1954, steam locomotives accounted for 26.3% of all locomotives and supplied 27.4% of the total tractive effort. Corresponding figures for diesel-electrics are 10.4% and 10.7% in 1946 and 71.6% and 70.4% at the end of 1954.

However, the report points out, "although the total number of locomotive units in service declined from 42,841 in 1946 to 32,872 in 1954, or a decrease of 23.3%, the total tractive effort was decreased only 14%."

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE SEPTEMBER ISSUE

Diesel-Electric Locomotive Orders

Road	No. of units	Horsepower	Service	Builder
Atchison, Topeka & Santa Fe	36[1]	1,750	Freight	Electro-Motive
	10[1]	2,250	Road switch.	Alco Products
Canadian National	3[2]	400	Road switch.	Canadian General Elec.
New York, New Haven & Hartford	10[3]	1,200	Switching	Electro-Motive
Savannah & Atlanta	1	1,600	General-purpose	Electro-Motive
Southern Pacific	185[4]	.....	.....	Alco Products Electro-Motive Fairbanks, Morse
Spokane, Portland & Seattle	9[5]	1,600	Road switch.	Alco Products
	6[5]	1,750	Road switch.	Electro-Motive
Utah	1[6]	1,600	Road switch.	Alco Products
Wabash	6[7]	1,750	Road switch.	Electro-Motive
Western Pacific	8[8]	1,750	General purpose	Electro Motive

Electric Locomotives

Virginian	12[9]	3,300	Roadswitching	General Electric

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Ann Arbor	100[10]	50-ton box	Pullman-Standard
Atchison, Topeka & Santa Fe	50[11]	Mechanical refrigerator	Company shops
Atlanta & West Point and Western of Alabama	100[12]	Box	Pullman-Standard
Baltimore & Ohio	1,000[13]	70-ton hopper	Bethlehem Steel
	500[13]	70-ton hopper	Pullman-Standard
	600[13]	Box	ACF Industries
	400[13]	Box	General American
Buffalo Creek	500[14]	Box	ACF Industries
	500[14]	Box	Pullman-Standard
Chicago & Eastern Illinois	200[15]	50-ton box	ACF Industries
	100[15]	50-ton box	Company shops
Chicago, Milwaukee, St. Paul & Pacific	100[16]	Cabooses	Thrall Car Mfg.
Erie	550[17]	Box	Greenville Steel Car
	500[17]	Box	General American
Illinois Central	2,000[18]	5-ton box	Company shops
Minneapolis, St. Paul & Sault Ste Marie	100[19]	70-ton gondola	Company shops
	30	70-ton covered hopper	Company shops
Missouri-Kansas-Texas	75[20]	70-ton covered hopper	Pullman-Standard
New York, Chicago & St. Louis	500[21]	50-ton box	General American
New York, New Haven & Hartford	500[22]	50-ton box	Pullman-Standard
Norfolk Southern	50[22]	50-ton gondola	Magor Car
	50[22]	50-ton pulpwood	Magor Car
Pennsylvania	100[24]	70-ton flat	Company shops
Southern Pacific	2,350[25]	Box	Company shops
	100[25]	50-ton pulpwood	Company shops
Union Pacific	200	Box	Company shops
	300	Auto box	Company shops
	50	70-ton covered hopper	General American
Wabash	50[26]	70-ton flat	Company shops
	100[26]	50-ton flat	Company shops
	500[26]	50-ton box	ACF Industries
	50[26]	70-ton gondola	Bethlehem Steel

Passenger-Car Orders

Road	No. of cars	Type of car	Builder
Canadian Pacific	3[27]	Rail diesel	Budd
Missouri-Kansas-Texas	1[28]	Rail diesel	Budd
Richmond, Fredericksburg & Potomac	2[29]	Coaches	Pullman-Standard

[1] Electro-Motive locomotives for delivery in second quarter of 1956; delivery of Alco locomotives expected to be completed this month.

[2] For early 1956 delivery.

[3] To cost in excess of $1,000,000. For delivery during December, January and February.

[4] Deliveries scheduled to begin in November and be completed in May. Most of the new units will be assigned to main-line freight service.

[5] Delivery of Alco units expected before the end of this year. Electro-Motive units scheduled for delivery early next year.

[6] Cost, $203,000. For delivery this month.

[7] Model GP-9 locomotives. For March 1956 delivery.

[8] Estimated cost, $1,488,000. To have been delivered last month.

[9] These are to be 197-ton, ignitron rectifier electric locomotives of the road-switcher type for delivery beginning in October 1956. The locomotives, with a C-C wheel arrangement and single cabs, control stations, and pantographs, are designed to operate on the Virginian's 11,000-volt, 25-cycle a-c catenary electric system. By using high-capacity rectifier tubes, the six traction motors per unit will have bridge type connection, giving the equivalent of motors in parallel with transitions eliminated over the complete operating range. Dynamic braking with retarding effect up to 63,000 lb at 25 mph is included in the locomotive design.

[10] PS-1 type, for delivery during March 1956.

[11] In addition to 150 ordered earlier this year. To be insulated for transporting frozen foods at temperatures of zero or lower. Original order expected to be completed this year; the additional 50, early in 1956.

[12] Half of these PS-1 cars will be 40½ ft long; the other half, 50½ ft. Cost, $710,000. Delivery expected late in second quarter of 1956. The roads have ordered 50 70-ton rebuilt gondola cars from the U.S. Railway Equipment Company at a cost of $173,000, for delivery this month. The roads are also converting in their own shops 100 box cars into wood rack cars.

[13] Deliveries expected during the first quarter of 1956.

[14] Cost of 1,000 cars, over $7,000,000. Road owned jointly by Erie and Lehigh Valley.

[15] Approximate cost of company-built cars, $10,000 each. Delivery expected during the second quarter of 1956.

[16] To be equipped with Duryea underframes. Deliveries to begin in November and continue for about three months.

ORDERS AND INQUIRIES (Continued)

[17] Cost of the Greenville cars, $6,937,500; the General American cars, $3,500,000. Five hundred of the Greenville cars for delivery early next year, to be equipped with "damage free" stowing devices, for shipping automobile parts and other freight. Delivery of the General American cars scheduled for second quarter of 1956.
[18] Estimated unit cost, $5,900.
[19] For delivery during first quarter of 1956.
[20] One hundred to be equipped with damage-free loading equipment. Scheduled for delivery in second quarter of 1956.
[21] Approximate cost, $600,000. Delivery scheduled for first quarter of 1956.
[22] The road in July announced its intention to purchase this equipment, at a cost of $4,000,000.
[23] Scheduled for delivery in February.
[24] An additional 275 70-ton open hopper cars will be purchased from a commercial builder. Of the total box-car order, 1,750 cars will be 50-ton, 50-ft, double-door cars; 250 will be of this type but equipped with boom-type automobile loading equipment; and 350 cars will be 50-ton, 50-ft, single-door cars equipped with "DF" loading equipment. The latter cars, in addition, will have the new hydra-friction underframe developed through joint research by the SP and Stanford Research Institute. An SP spokesman said this was the first mass-production order for the new type underframe which was described in the June issue, page 61.
[25] Company-built cars for delivery during first quarter of 1956; ACF cars, for delivery in April; Bethlehem Steel carts, for delivery in December.
[26] Each car to be equipped with roller-bearing trucks and rubber-cushioned draft gears.
[27] Delivered last month. The first unit is an all-passenger coach (RDC-1). One of the other two units, an RDC-2, will accommodate passengers and baggage. The third, an RDC-4, will carry mail and baggage only.
[28] Approximate cost of this RDC-3, $170,000.
[29] To be lightweight stainless steel. For delivery this year.

NOTES:

Boston & Maine.—The B&M directors have authorized purchase of 1,000 50-ton roller-bearing-equipped box cars at an approximate cost of $8,000,000. This is the largest single order for freight cars ever placed by the B&M, as well as its first purchase of freight cars equipped with roller bearings. Delivery is anticipated during the first quarter of 1956. The cars will be 50½-ft long, with 9-ft side doors.

Canadian Javelin, Ltd.—Canadian Javelin, of Montreal has been securing prices for a minimum of 700 and a maximum of 1,100 100-ton gondola-type roller-bearing ore cars for delivery in the spring of 1957. The cars, which are to be similar to those now in use on the Quebec North Shore & Labrador, are for a new railroad which Javelin is building from a connection with the QNS&L to new ore deposits in the vicinity of Wabush Lake, Labrador.

Great Northern.—The GN is converting 24 flat cars into a special compartmentalized design to handle shipments of aluminum ingots between two separated plants of the Kaiser Aluminum & Chemical Corp. in the Spokane, Wash., area. The work is being carried out by GN shop forces at Hillyard (Spokane) shops. Each car will be capable of holding 28 ingots weighing 5,000 lb apiece. The design will permit loading the ingots with lift trucks.

Louisville & Nashville.—The L&N is installing "ride control packages" on 1,420 freight cars, replacing conventional AAR 1936 design freight car truck springs. Total cost will run to $291,100. The road also will replace, at a cost of $168,655, the sides and floors on 240 composite hopper cars with steel sides and floors.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
June, 1951	2,874,873	7,074	15,376	22,450	128,057
June, 1952	2,672,513	8,466	14,495	22,961	116,394
1953					
June	2,926,001	8,537	15,296	23,833	122,771
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,710	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666

Revenue Basis for Class I Roads Raised to $3 Million

The minimum annual-revenue requirement for designation as a Class I railroad will be increased from $1 million to $3 million, effective January 1, 1956. All roads with annual gross of less than $3 million will be Class II, so there will be only two classes instead of the present three.

The Interstate Commerce Commission has so ordered after considering views submitted by interested parties in response to the commission's notice of its intention to issue the order.

The new set-up will remove 13 roads from the Class I group, but it will bring in four which would now be in except for the fact that there have been no reclassifications for several years. The effect on aggregate annual revenue of the Class I group will be slight. The total for the new group is expected to be 0.11% less than that of the present group.

The four new Class I roads will be: Litchfield & Madison; Savannah & Atlanta; Minnesota, Northfield & Southern; Carolina & Northwestern.

The commission order stipulates that the classification shall be based on the average annual operating revenues for the three-year period ended with the calendar year 1955; "and, subsequently, if at the close of any calendar year the average of the annual operating revenues for the latest three-year period is greater or less than the amount applicable to the class in which the carrier has been reporting, its class for the second succeeding year shall change accordingly and it shall remain in such class for a period of not less than three consecutive years."

The order also provides that, in applying the classification to a switching and terminal company which is operated as a joint facility, the sum of the annual railway operating revenues, the joint facility rent income, and the returns to joint facility credit accounts in operating expenses, shall be used in determining the class."

MacDonald New Safety Chief

Francis C. MacDonald, new chief of the Section of Railroad Safety in the ICC's Bureau of Safety and Service, has been a member of the commission's staff since 1920. He was assistant chief of the section when he moved up September 1 to succeed Shirley N. Mills, retired.

After 17 years in railroad service, Mr. MacDonald joined the ICC as a field inspector of safety appliances at Chicago. In 1937 he was transferred to Washington, D.C., as inspector, accident investigation, later in the year becoming chief of the Accident Investigation Section. In 1938 he was named chief of the Safety Appliances Section and in 1954 became acting assistant director of the Bureau of Safety. When that bureau was merged into the present Bureau of Safety and Service, he was appointed assistant chief of the Section of Railroad Safety.

As successor to Mr. Mills, Mr. MacDonald has also been named assistant director of the Bureau of Safety and Service. He will reach retirement age this year.

Diesel Oil Purchases Up 10% in First Four Months

Purchases of diesel fuel in the first four months this year were 10% greater than in the same period in 1954, according to the July issue of "Transport Economics" of the Bureau of Transport Economics and Statistics, Interstate Commerce Commission.

Railroads purchased 1,141,888,000 gallons of diesel fuel in the 1955 period, as against 1,037,864,000 last year. Average cost per gallon of the oil declined by 1.1%—from 9.8 cents to 9.7 cents in the four-month period.

For the same period, the report states, coal purchases declined 18.5%, comparing 1955 with 1954. Class I roads purchased 5,402,000 tons of coal through April this year as against 6,619,000 last year. Of the 1955 purchases, 5,221,000 tons were bought at mines and 181,000 tons at places other than mines, against 6,472,000 tons and 147,000 tons, respectively, in 1954.

Average cost per ton of coal at the mines this year was $4.56, down 3.2%

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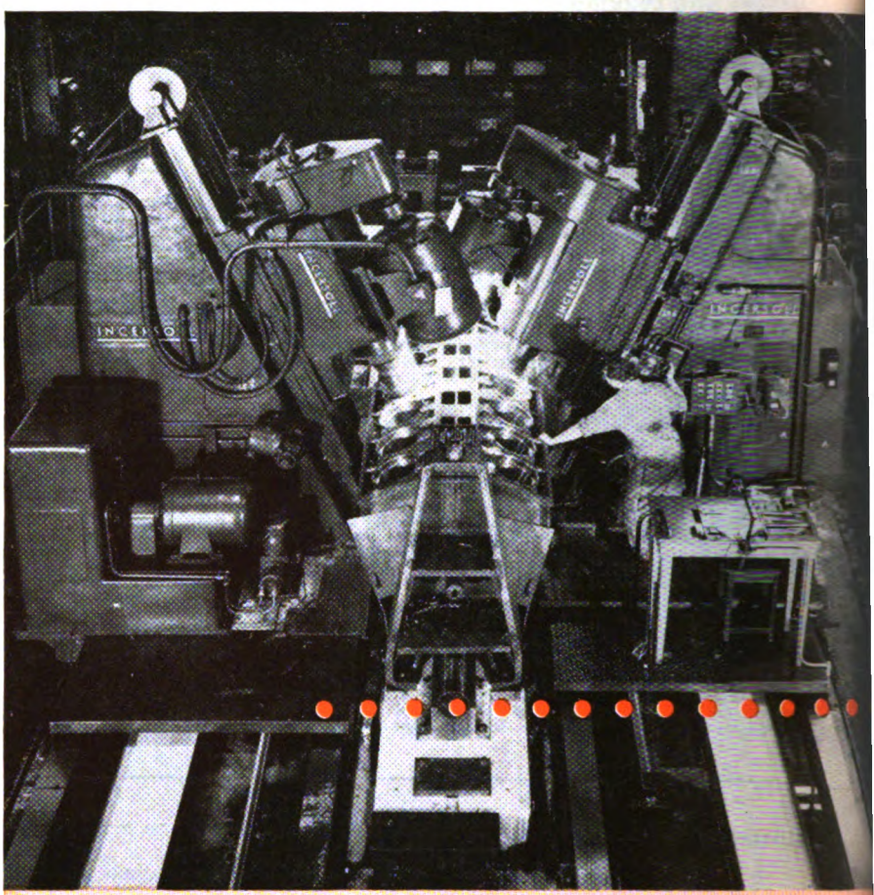
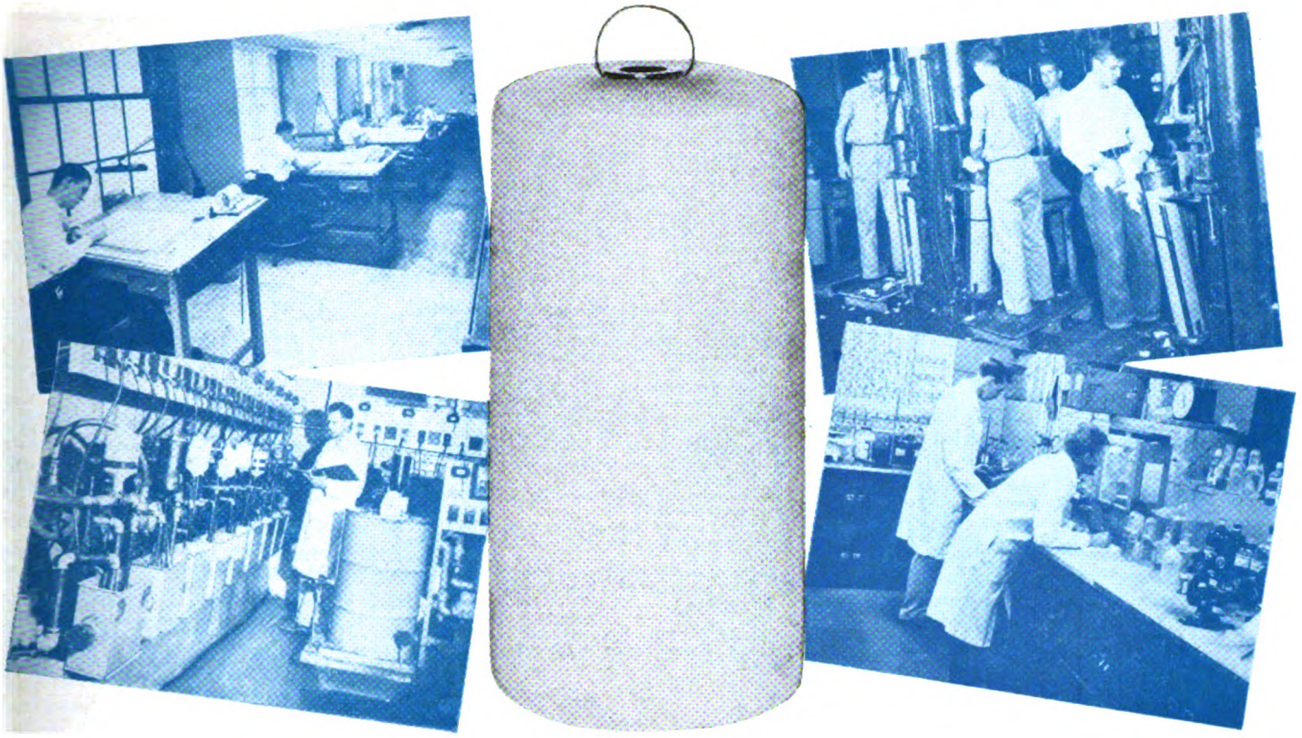


Gulf Quality Lubricants safeguard costly equipment like this in the Electro-Motive Plant. Leading Gulf brands used here include Gulf Harmony Oil for hydraulic systems; Gulf Gem Oil for spindles; Gulfcrest Oil for turbines; Gulf Anti-Friction Grease, Gulf Precision Grease; Gulf HM Grease, Gulf High Pressure Grease, and Gulf Plastic Petroleum B for various grease lubricating applications.

The New York Central is one of scores of railroads that use Gulf Dieselmotive Oil for better lubrication of their Diesel locomotives and lower maintenance costs.



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NEWS

(Continued from page 15)

from the average cost of $4.71 last year. At places other than at mines, averaging cost per ton was $8.67 this year compared with $9.10 in 1954, a price drop of 4.7%

Class I railroad purchases of fuel oil declined 21.1% in the period covered in the report, from 5,660,000 barrels in 1954 to 4,468,000 barrels this year. Gasoline purchases also dropped, by 2.5%, from 15,107,000 gallons last year to 14,733,000 this year, while purchases of electric current rose by 2.5% from 711,984,000 kilowatt-hours for the 1954 period to 729,777,000 kwh this year.

Average cost of fuel oil purchased during the four-month span rose by 5% this year, from $2.02 per barrel to $2.12 per barrel. Gasoline costs declined by 0.2% from 19.48 cents per gallon in 1954 to 19.45 cents this year, while electric current was down 3.4%, from 1.152 cents per kwh in 1954 to 1.113 cents per kwh this year.

New "RB" Type Freight Car Tested

An entirely new type of freight car designed to provide swift loading and unloading of "utilized" lading, has been built by International Steel Company, Evansville, Ind.

The "RB" type car (refrigerated car, without ice bunkers) was designed and built for a newly formed company, the Unit Load Car Corporation. It was service tested throughout September by the Calumet Industrial District Company, a food warehousing firm at Chicago.

Features of the new car include ten overhead garage-type doors, five to the side. The interior is divided into five compartments with permanent bulkheads, each compartment having a floor area of 69 sq. ft. The doors provide a 7-ft, 6-in by 9-ft, 3-in opening into each compartment.

New materials are widely used in the car. Floor, ceiling and bulkheads are of sandwich construction, using expanded Styrofoam for insulation. The lading floor is aluminum.

The built-in bulkheads are constructed of a steel framework in which sandwich panels are adhesively secured. These panels—and the ceiling—are faced with polyester inpregnated Fiberglas. The bulkheads are equipped with band anchors.

Primary purpose of this car is to facilitate loading and unloading of palletized lading with fork or lift trucks. It was designed by and built for a shipper. It is expected to reduce loss and damage claims; and it aims at elimination of dunnage or loose devices for securement of lading.

Use of the Styrofoam insulation and Fiberglas facings inside the car will, the designer believes, provide an odorless, moisture-proof, vermin-proof and corrosion-proof interior.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of June		5 months ended with June	
		1955	1954	1955	1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,781	5,852	30,649	38,214
3-06	Total, Diesel-electric	35,723	32,633	207,489	190,513
3-07	Total, electric	749	638	4,356	3,871
3-04	Total, locomotive-miles	42,460	39,267	243,741	233,190
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,705	1,497	9,702	8,869
4-06	Empty, total	933	897	5,399	5,218
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	13,088	11,997	70,845	74,904
6-02	Total in oil-burning steam locomotive trains	2,901	2,374	10,016	13,057
6-03	Total in Diesel-electric locomotive trains	101,971	90,542	585,333	525,596
6-04	Total in electric locomotive trains	2,359	2,007	13,371	11,934
6-06	Total in all trains	120,999	107,424	683,777	627,588
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.02	1.02	1.02
10-02	Loaded freight car-miles	43.2	40.8	42.7	40.7
10-03	Empty freight car-miles	23.6	24.5	23.7	24.0
10-04	Total freight car-miles (excluding cabooses)	66.8	65.3	66.4	64.2
10-05	Gross ton-miles (excluding locomotives and tender)	3,066	2,932	3,008	2,882
10-06	Net ton-miles	1,392	1,296	1,352	1,270
12	Net ton-miles per loaded car-mile (M-211)	32.2	31.7	31.7	31.2
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.6	62.5	64.2	63.0
14	Averages per train hour (M-211):				
14-01	Train miles	18.5	18.5	18.8	18.8
14-02	Gross ton-miles (excluding locomotive and tender)	56,034	53,789	56,084	53,805
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	48.7	43.3	46.1	42.1
14-02	All	46.0	40.7	43.4	39.8
15	Average net ton-miles per freight car-day (M-240)	958	808	883	781
17	Per cent of home cars of total freight cars on the line (M-240)	44.4	53.4	48.4	54.1

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,440	2,276	8,430	14,594
3-06	Diesel-electric	20,151	20,774	120,997	124,165
3-07	Electric	1,257	1,344	7,916	8,387
3-04	Total	22,854	24,394	137,349	147,146
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	236,088	246,413	1,391,665	1,469,454
4-09	Total in coal-burning steam locomotive trains	7,768	10,092	47,855	72,814
4-10	Total in oil-burning steam locomotive trains	5,847	10,964	23,842	51,079
4-11	Total in Diesel-electric locomotive trains	208,076	210,673	1,228,992	1,252,030
12	Total car-miles per train-miles	9.91	9.72	9.74	9.62

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	300,900	306,628	1,597,896	1,923,611
1-02	Steam, oil-burning	60,774	60,638	268,477	323,427
1-03	Diesel electric	3,612	3,263	20,909,384	19,511,002
1-06	Total	3,979,656	3,638,133	22,815,380	21,815,458
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	7,112	10,938	54,306	76,807
2-02	Steam, oil-burning	5,482	5,112	30,234	26,589
2-03	Diesel-electric[1]	240,730	251,730	1,458,941	1,527,828
2-06	Total	278,618	292,725	1,696,998	1,790,594
3	Hours per yard locomotive-day:				
3-01	Steam	6.3	5.0	5.2	4.8
3-02	Diesel-electric	15.9	15.1	15.3	15.0
3-05	Serviceable	15.6	14.5	15.1	14.4
3-06	All locomotives (serviceable, unserviceable and stored)	13.9	12.5	13.2	12.3
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.62	1.69	1.63	1.71
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.73	0.74	0.75	0.75

[1]Excludes B and trailing A units.

PERSONAL MENTION . . . . . .

Chesapeake & Ohio

R. W. LLEWELLYN appointed master mechanic at Newport News, Va. Position of assistant master mechanic abolished.

Chicago & Eastern Illinois

Danville, Ill.

B. J. HUFF, master car builder, retired.

D. L. CRONKITE, assistant master car builder, appointed master car builder.

H. H. FARTHING, general car foreman at Yard Center, Ill., appointed assistant master car builder.

Elgin, Joliet & Eastern

PAUL H VERD appointed acting general manager at Chicago, with jurisdiction over the maintenance-of-way, maintenance-of-equipment, and transportation departments.

New York, Chicago & St. Louis

HAROLD LANDES appointed assistant car foreman at Gambrinus, Ohio.

Frankfort, Ind.

W. H. DUNN appointed roundhouse foreman.

LILBURN J. LIPP appointed assistant roundhouse foreman.

R. MARTIN appointed erecting shop foreman.

N Y C & St L (continued)

Brewster, Ohio

O. O. BROWN, JOHN BALTZER, F. W. BUEHLER, I. R. PETTAY, and C. E. FERGUSON appointed assistant car foremen.

New York Central

R. D. TIMPANY appointed acting master mechanic at Dewitt, N. Y.

New York, New Haven & Hartford

SAMUEL J. MASSEY, JR., appointed general manager, with jurisdiction over mechanical and engineering departments.

Mechanical department reorganized to improve locomotive reliability and functioning of air-conditioning apparatus as follows:

W. J. HARLOW, general mechanical superintendent, now general master mechanic, with jurisdiction over Division master mechanics and traveling master mechanic (a new position).

WILSON E. SYMONS, assistant general superintendent, now superintendent of equipment. Jurisdiction over car and locomotive cleaning supervisor, supervisor of apprentices, production supervisor, supervisor of car maintenance, inspection of passenger-train equipment and engineer of tests.

RUSSELL H. DAVIS, superintendent of car maintenance, now general shop superintendent. Jurisdiction over shops at Van Nest, N. Y., and Readville, Mass.

CARL L. HARTSHORN, assistant to the general mechanical superintendent, now superintendent of power plants and facilities. Jurisdiction over all power plants, machine-tool modernization, work method procedures, simplification and mechanization.

VIRGIL F. DOWDEN, assistant mechanical engineer, now electrical engineer, Responsible for, among other things, operation and performance of air-conditioning and equipment.

JOSEPH M. QUINN, assistant superintendent of car maintenance, now supervisor of car maintenance.

GEORGE J. HIGGINS, assistant to general mechanical superintendent, now traveling or acting master mechanic, with headquarters at Stamford, Conn.

Norfolk & Western

L. M. NEWTON appointed assistant road foreman of engines at Bluefield, W. Va.

F. H. WILBOURNE, assistant road foreman of engines, Radford division, transferred to Shenandoah Division.

P. C. CABINESS appointed assistant road foreman of engines, Radford division.

Pittsburgh & West Virginia

F. N. LUSCHER appointed road foreman of engines.

THOMAS MCCREADY appointed assistant road foreman of engines.

Southern Pacific

Stanley M. Houston

STANLEY M. HOUSTON appointed general superintendent motive power at San Francisco, as noted in the September issue. *Born:* Albuquerque, N. M., June 5, 1898. *Education*: Correspondence and night schools; Stanford Graduate School of Business; *Career*: Became a machinist apprentice on the Arizona Eastern (now SP) on April 1, 1913. Subsequently served as a machinist, roundhouse foreman, general foreman, and master mechanic at various locations on the SP; and as shop superintendent, superintendent of motive power, and assistant general manager of the Southern Pacific of Mexico. In May 1937 he returned to the United States, becoming successively assistant master mechanic of the SP at Oakland, Cal.; master mechanic; assistant superintendent motive power at Los Angeles,, and, in 1942, assistant general superintendent motive power.

Seaboard Air Line

W. J. SUBER, road foreman of engines at Norlina, N. C., appointed shop superintendent, Jacksonville shops, with jurisdiction over mechanical department matters at Baldwin, Fla.

Southern

Columbia, S. C.

GEORGE A. FLOYD appointed foreman enginehouse (day).

CAREY W. FUTCH, JR., appointed foreman enginehouse (night).

Atlanta, Ga.

HAROLD K. TUBBS, JR., appointed assistant foreman roundhouse.

BENJAMIN B. JONES, JR., appointed foreman car inspectors.

Union Pacific

WILLIAM PARRY appointed engineer locomotive construction and maintenance at Omaha, Neb. Formerly master mechanic of the Western Pacific at Elko, Nev.

J. J. CARROLL, general foreman at Omaha, Neb., appointed shop superintendent at Salt Lake City.

SUPPLY TRADE NOTES . . . . . .

BALDWIN-LIMA-HAMILTON CORPORATION.—*E. H. Schoonmaker,* manager of the St. Louis sales office, has been appointed eastern district sales manager, at New York. He has been succeeded at St. Louis by *W. A. McKnight* of the Houston office.

■

TIMKEN ROLLER BEARING COMPANY.—*John Rundt* has been appointed chief engineer, division of research and development.

■

NATIONAL ALUMINATE CORPORATION.—*Robert G. Bielenberg,* manager of transportation service, has been named assistant vice-president of the transportation division.

■

COMBUSTION ENGINEERING, INC.—*Frank J. Bader,* district manager, at San Francisco, has been appointed assistant general sales manager at New York. *Herman C. Reichard* has been transferred from the Kansas City sales office to succeed Mr. Bader at San Francisco.

■

VAN DER HORST CORPORATION.—*Van der Horst* has purchased industrial property at 2610 South Shields avenue, Chicago, consisting of 37,000 sq ft of manufacturing facilities and 15,000 sq ft of yard space. It will establish a plant there, which is expected to be in production early in 1956.

■

ARMCO STEEL CORPORATION.—*Paul F. Pardonner,* assistant manager of the Detroit sales district, has been named manager, succeeding *R. L. Shugg,* who will continue with the company in a consulting capacity.

■

INDUSTRIAL BROWNHOIST CORPORATION.—*Max Riebenack, III,* executive vice-president, has been elected president. *Stanley R. See,* director of sales for the eastern region, has been named vice-president and assistant to president.

■

GREENVILLE - EVANS COMPANY. — Greenville-Evans Company, jointly owned by the Greenville Steel Car Company and Evans Products Company, has been formed to rebuild and upgrade railroad rolling stock. The operation will include purchase of old cars; reconditioning and modern-

(Continued on page 90)

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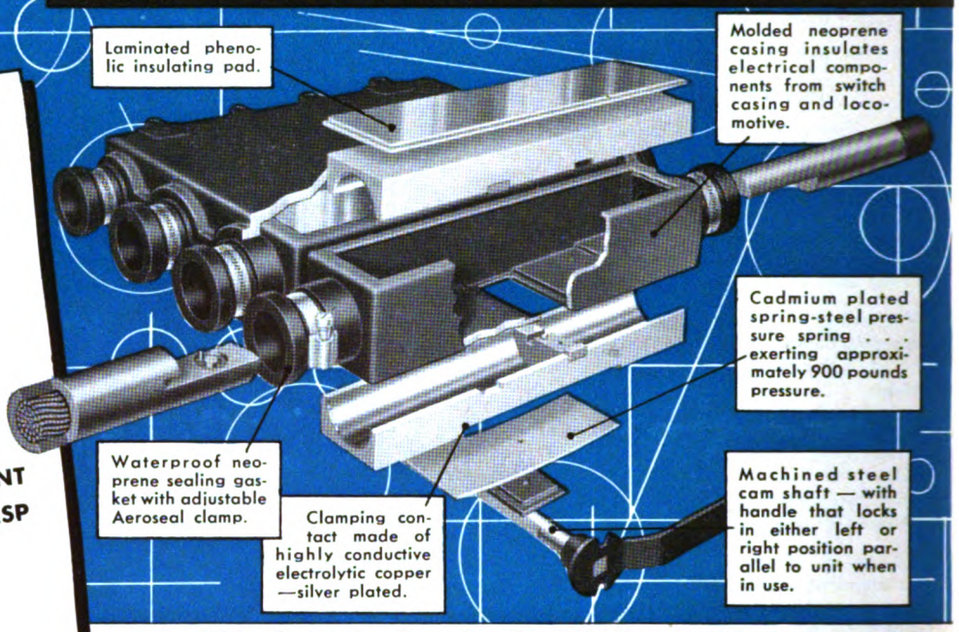
- ★ NO SERVICING REQUIRED
- ★ LASTS FOR LIFE OF LOCOMOTIVE
- ★ FITS ALL PRESENT EQUIPMENT
- ★ USES PRESENT CLASP CONNECTIONS
- ★ POSITIVE MECHANICAL CONNECTION
- ★ SELF CONTAINED & WEATHERPROOF



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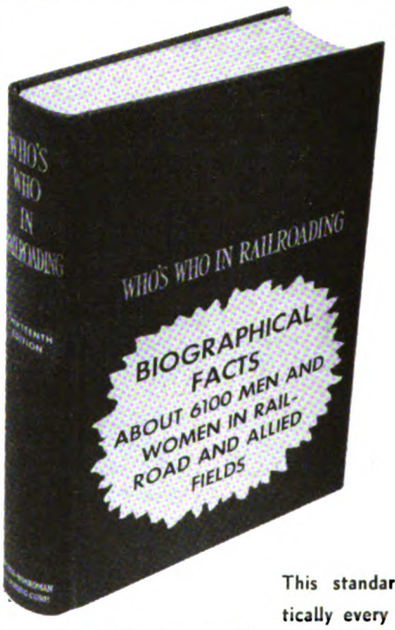

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EDITORIALS . . . . . .

Life Span Should Control Maintenance

The diesel which came to the rescue of the railroads in a time of need, is in itself a major problem. It can do greater things than the steam locomotive, but to assure good performance, different things have to be done to it.

Various groups of men converge upon the diesel problem from different angles. The operator wants to get out the last ounce of performance that is built into it. Those in charge of running maintenance try to keep the locomotive at top performance, and endeavor to anticipate any possible cause of failure. The engineering and maintenance of way departments produce ever better track which will permit the diesel to do its best. The men in the heavy repair shop periodically put locomotives in as near new condition as is economically practicable,—wishing all the while that the operating department would derate the locomotives—just a little.

The manufacturers are building the best locomotives they know how to build, and their own design departments are constantly making improvements which upset the work of the production department. This making of changes is also highly distressful to the railway stores and maintenance departments, not to mention the drafting room. To add, apparently to the confusion, the railroads' mechanical and electrical engineers are constantly coming up with ideas for improving locomotive design, better shop practices and other ways of getting better performance and reducing costs.

The situation is one which calls for over-all planning. Each department concerned with diesel operation and maintenance plans its work to meet what is expected of that department. Over-all planning is necessary to coordinate the work of the several departments. Successful planning in turn could be helped immensely by some means whereby it would be possible accurately to predetermine the economic life of a diesel.

Knowing what the life was going to be, future needs could be provided for, over-maintenance could be avoided and the scrap value of old locomotives could be held within narrow limits. The economic advantages of such planning would seem obvious.

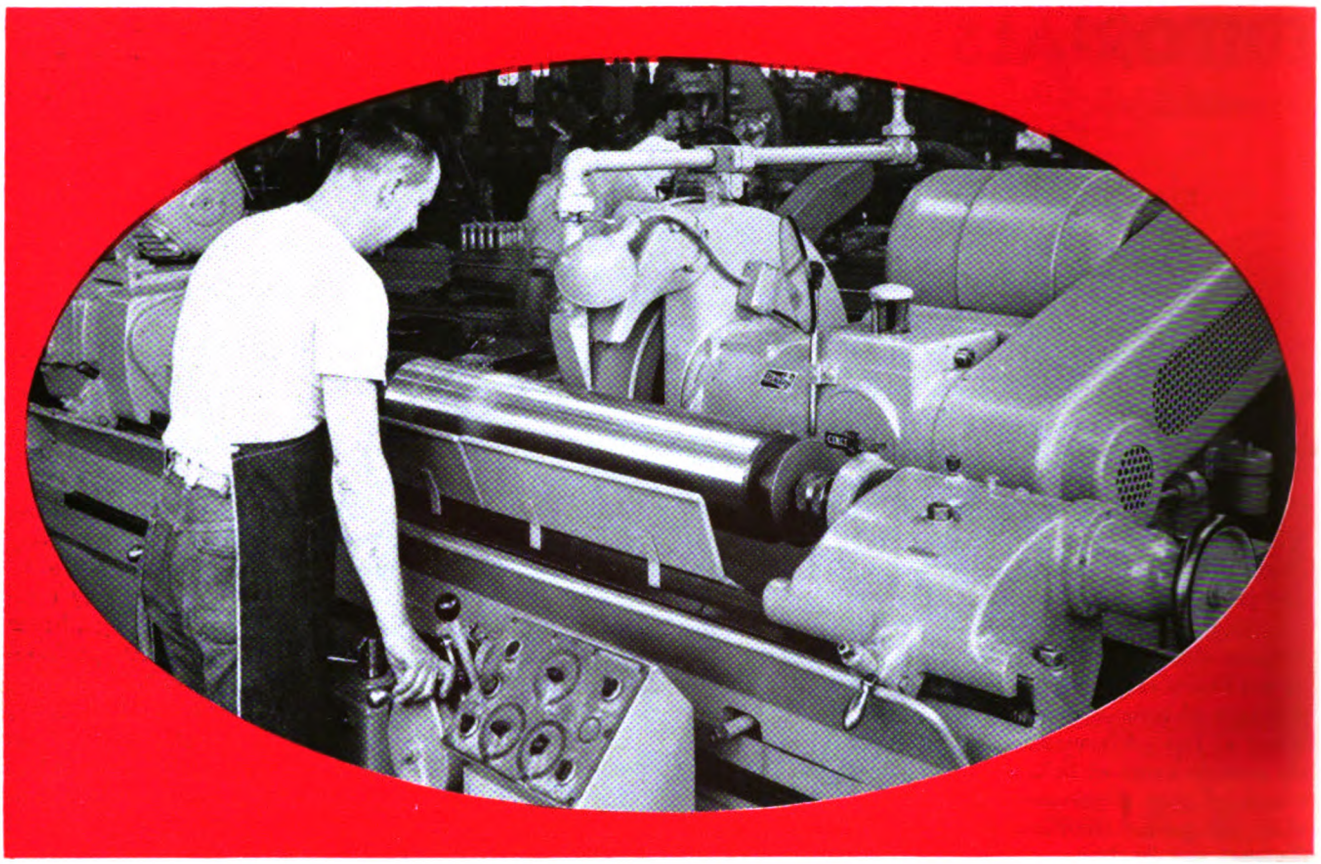
What the Alert Car Inspector Finds

"Excessive side bearing clearance, A; truck center plates binding, A and B; dust guards worn out, L-3 and L-4; brake hanger worn out, L-1; running board decayed, B end"—unfortunately reports such as this are turned in all too often and reflect conditions which conscientious car men uncover in the course of their daily work inspecting freight cars in train yards.

One more specific instance of a tank car which was also overdue for journal box repacking, showed the following imposing list of defects: "End running board brackets loose, A and B; tank bands loose, A and B; body bolster broken, A end; dust guards worn out, R & L, 1,2,3,4; box bolt nut missing, L-2; tank cradle block missing, A end; tank center anchor bolts loose and missing, R & L; slack draft gear, B end; loose hand brake ratchet wheel; truck snubber worn out, BL; truck spring out of place, BR; journal boxes worn out and working in truck frame, L-1 and L-2; oil box bolts loose, R 1,2,3,4."

This sounds more like the description of a car about ready to be retired and scrapped than one just received in a train yard from revenue service on a Class 1 railroad. As a matter of fact, the conditions described cannot be tolerated, especially in these days of high-speed operation. An adequate force of qualified car inspectors is required to ferret out all defects and supervisors must be backed up by their respective managements in holding cars, whether railroad or private owned, out of service until necessary repairs are made.

This does not mean excessive technicality and slavish adherence to the last letter of the law, as set down in the AAR interchange rules, for everyone knows that would tie up equipment and disrupt railroad service in short order. While so-called "judgment defects" introduce an element of uncertainty and should be minimized to the fullest extent practicable, *good* judgment is required in the interpretation and application of AAR rules and it is here that car inspectors and supervisors make their major contribution to railroad service. Undoubtedly their most important single duty is to see that freight cars and other interchange equipment having defects with a bearing on safety are held out of service and not released until the unsafe conditions have been corrected.



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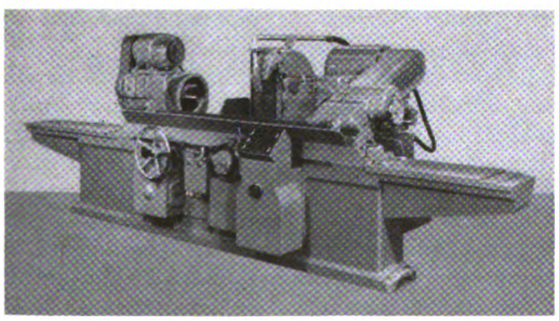

Accuracy begets accuracy. It's especially true for radial drill columns, where high-quality finish and accurate, straight sizing are basic considerations to high-quality performance. While the CINCINNATI FILMATIC 16″ Plain Grinder in the illustration is not grinding a railroad part, it is the type of machine railroad shops should have for grinding large parts at low cost and to high standards of quality. These machines have many advantages for quickly grinding large work to the highest quality desired:

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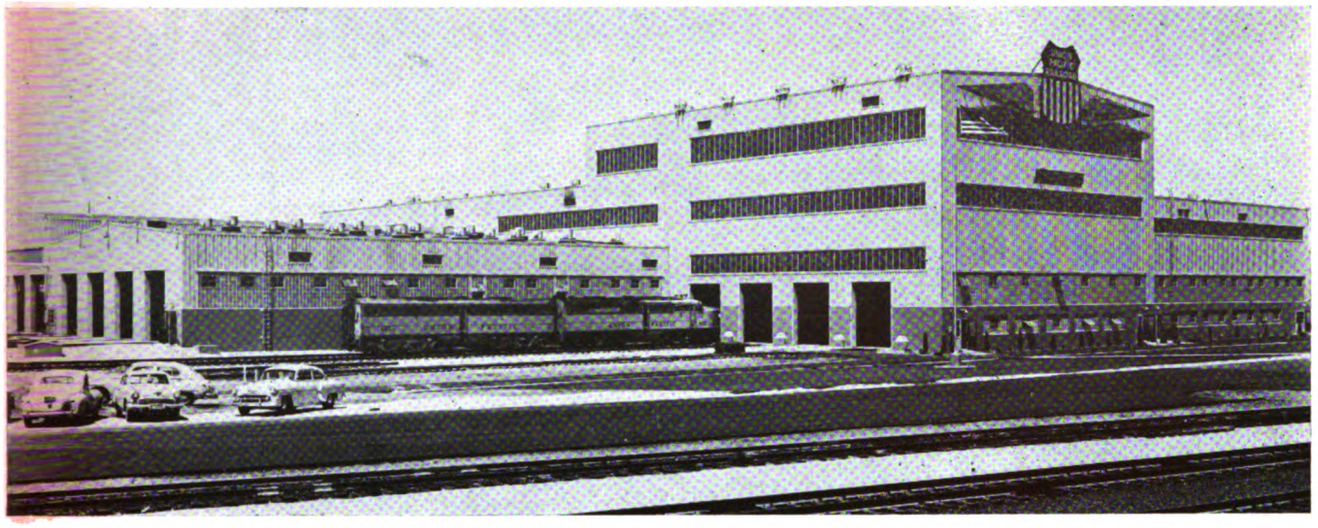


UP Opens Salt Lake City Diesel Shop

Present output of six heavy repair diesel engines and units a month will be stepped up to 20 at full production—about 4,000 units a month are inspected and serviced.

The new $6,000,000 locomotive servicing and repair shop of the Union Pacific at Salt Lake City, Utah, was officially opened August 2.

With a shop output of 4,000 units inspected and serviced monthly, this shop also overhauls six diesel units, including the engines, a month. With the shop in full production, employing a force of about 400 men and annual payroll of $1,800,000, it is anticipated that the output will be stepped up to 20 heavy repairs a month in addition to the units given normal daily attention.

The main shop building, 424 ft long by 162 ft wide, extends in a general north-south direction and houses four raised tracks with elevated platforms for heavy diesel unit repairs. It also includes the wheel shop, stores department, tool room, parts repair and cleaning rooms. A 324-ft by 80 ft wing just west of the main shop has three tracks with raised platforms and is devoted to running service repairs. A 264-ft by 102-ft wing extension on the east has a heavy repair bay, also two engine overhaul bays, an electric shop and the general office. The total floor area is 144,000 sq ft and the shop building covers 2.8 acres.

There are five different roof elevations in the plant ranging from 32 to 77 ft. The shop is served by five traveling bridge cranes, one Whiting 270-ton crane in the heavy-repair bay and four Northern cranes of 35, 20 and 10-ton capacities in various departments as indicated in the floor plan.

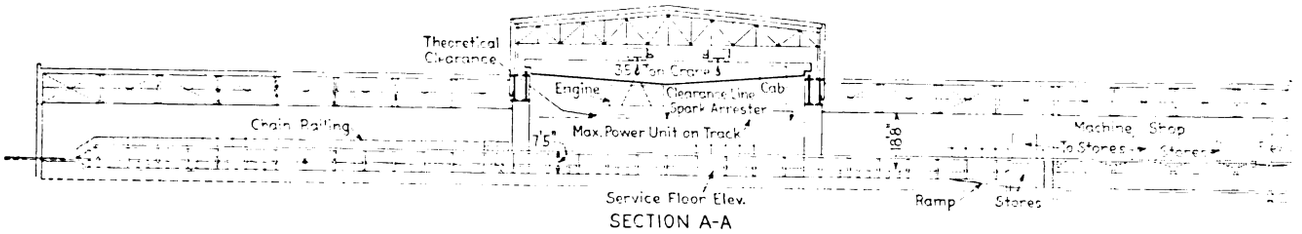
To permit installation of the 270-ton crane which can safely lift the largest UP diesel unit and the even heavier gas-turbine locomotive which is 83½ ft long and weighs 275½ tons, a section of the building had to be left unroofed until the crane was erected.

The Whiting 90-ton drop table for removing complete trucks from under diesel units presented a special problem in construction. The ground water level in the area is just 6 ft down and the drop pit had to be designed

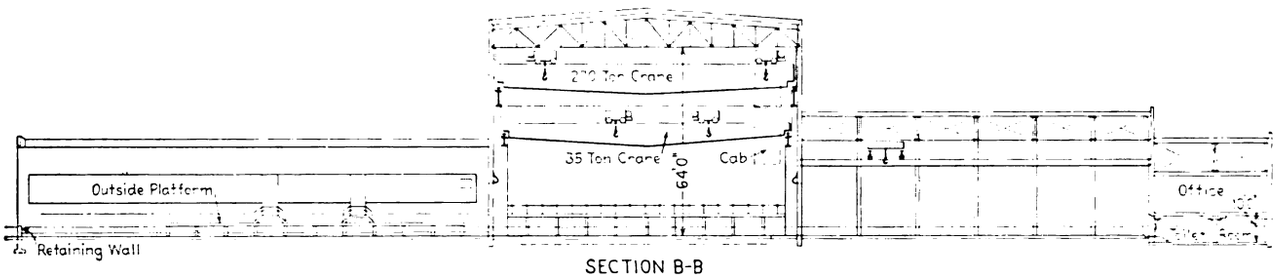
Principal Machine Equipment in UP Salt Lake City Shop

1	Standard wheel-truing machine
1	De Laval oil Puri-Filter unit
1*	Paxton-Mitchell Model-240 wheel-washing machine
1*	Yale 6,000-lb capacity electric fork-lift truck
1	Rogers 600-ton capacity wheel press
1	Westinghouse type 4-C air brake test rack
1	Magnuflux RTLL inspection unit
1	Magnaflux RC-1925 Magnaglo inspection unit
1	Cincinnati-Bickford 5-ft radial drill
2	Cincinnati-Bickford 4-ft radial drills
1	Chambersburg 75-ton capacity bushing press
1	Bullard Model-75 Cut-Master vertical turret lathe
2*	GE No. 17 engine load resisters
1	Betts heavy-duty hydraulic-feed car wheel borer
2*	Elwell-Parker 6,000-lb electric platform crane trucks
1*	Yale 8,000-lb capacity electric fork-lift truck
1	Farr air filter washer-oiler machine
13	GE battery chargers
2	Crane air-brake lapmaster machines
1	Niles 52-in. wheel lathe
1	Lucas horizontal drilling and milling machine
1	Monarch engine lathe
1	Niles side-head boring mill

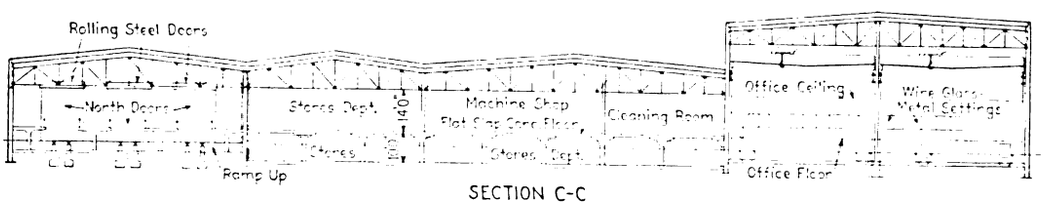
*Located adjacent to shop



SECTION A-A

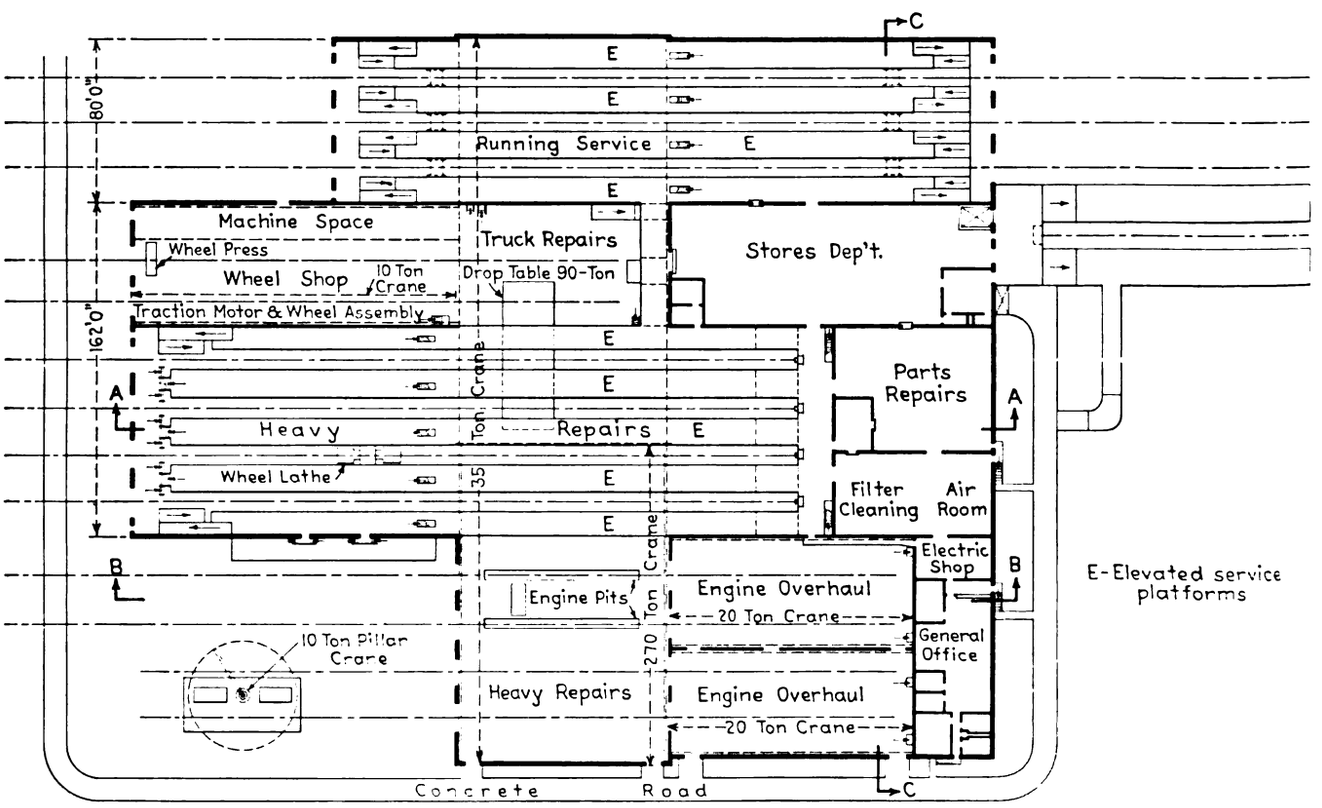


SECTION B-B

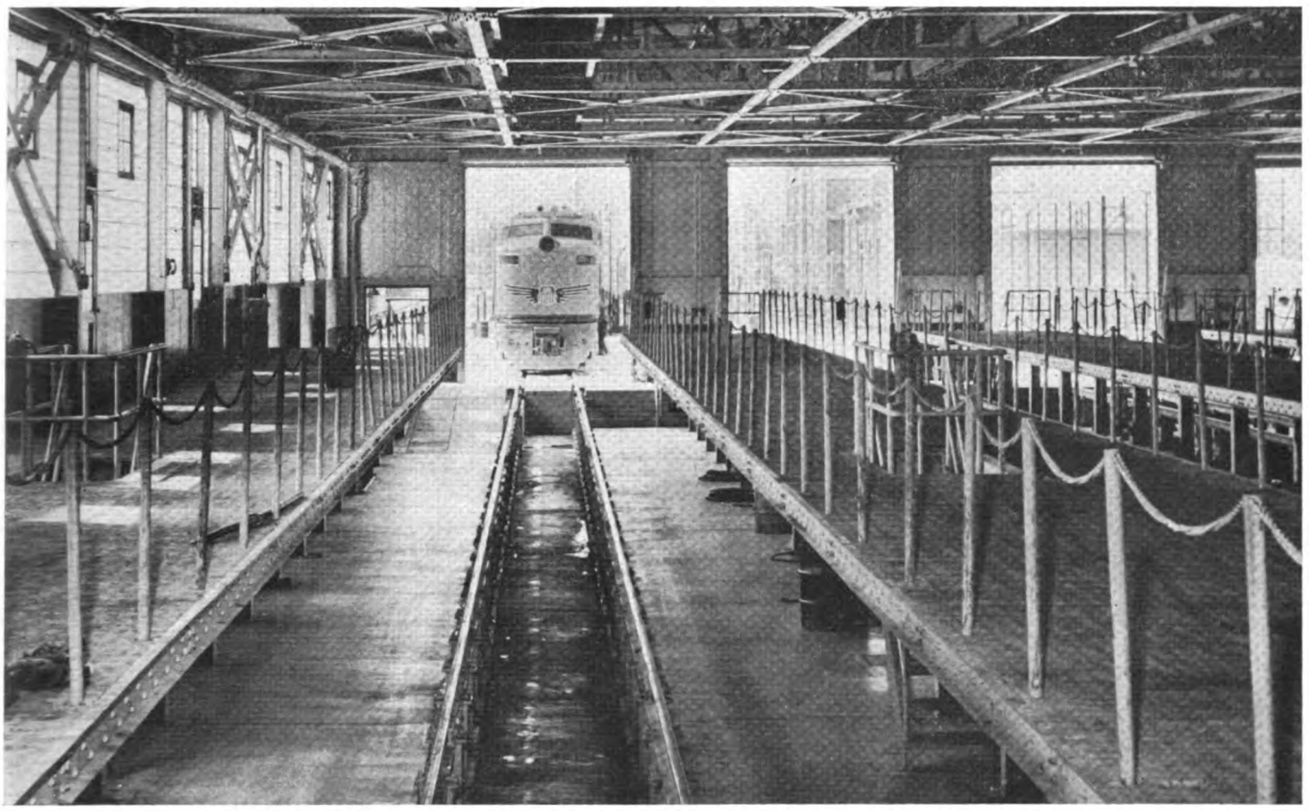


SECTION C-C

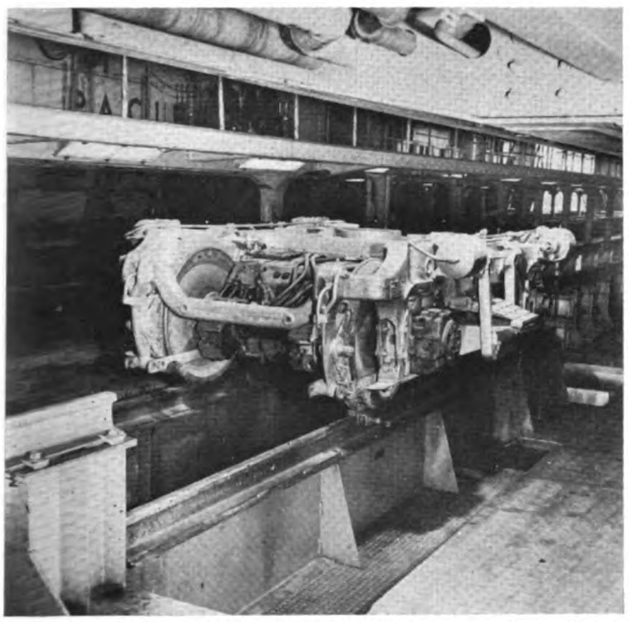
Sections through UP diesel repair shop at Salt Lake City, Utah.



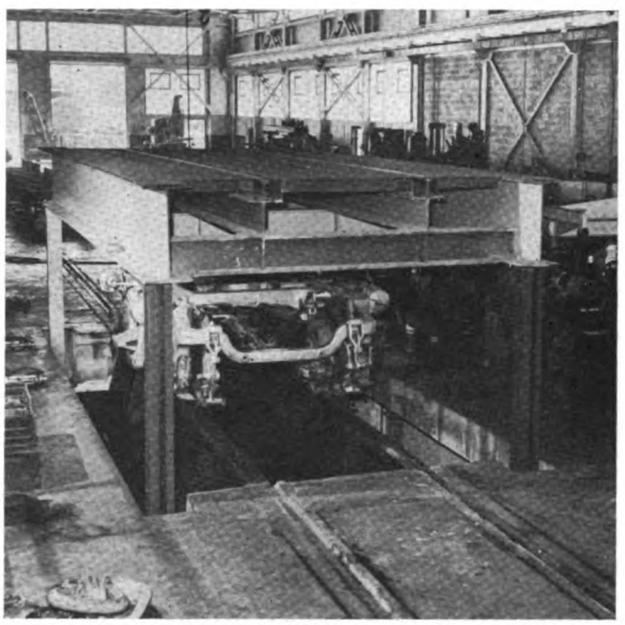
U.P. Diesel locomotive maintenance and repair shop.



Elevated tracks with ramps on both sides facilitate access to locomotives during repair work.



A set of trucks on the 90-ton drop table. When in use, a locomotive is parked with a set of trucks directly over the drop table.

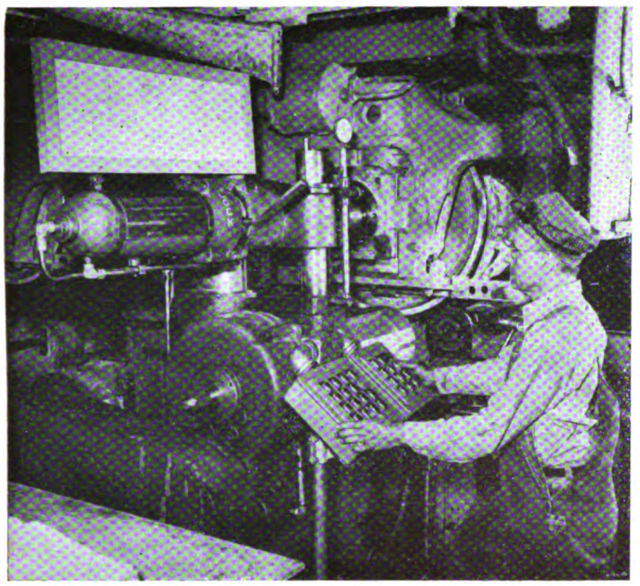


Whiting drop table bringing a diesel truck up to the level of the truck shop floor.

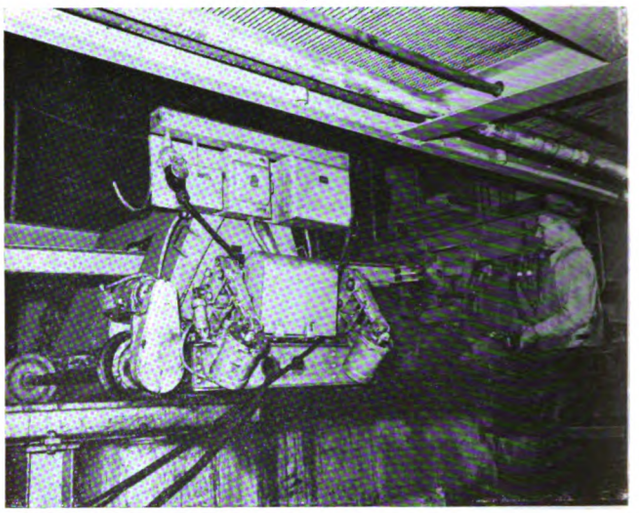
to take care of buoyancy as well as trucks. It was constructed heavy enough so that the weight overcame the buoyancy.

The Standard wheel-truing machine, installed in one track of the main shop building in October 1954 at a cost of $135,000 has already proved its value. In the first nine months of multiple-shaft operation, this machine was used to restore the standard tread and flange contour of 2,500 pairs of diesel wheels without removing them from their respective locomotive units. A single pair of wheels can be retrued, if necessary, and the locomotive unit returned to service in a total of 1½ hrs or less.

Cleaning various locomotive parts constitutes a major operation in any diesel shop and the UP Salt Lake shop is well equipped in this respect. One of the newer machines is a Farr automatic air filter washer with roller conveyors moving filters to the dryer and oiler at the rate of 60 an hour, or about as fast as one man can handle them into the machine and out of the oiler.



Standard wheel-truing machine being operated from a push-button control panel.

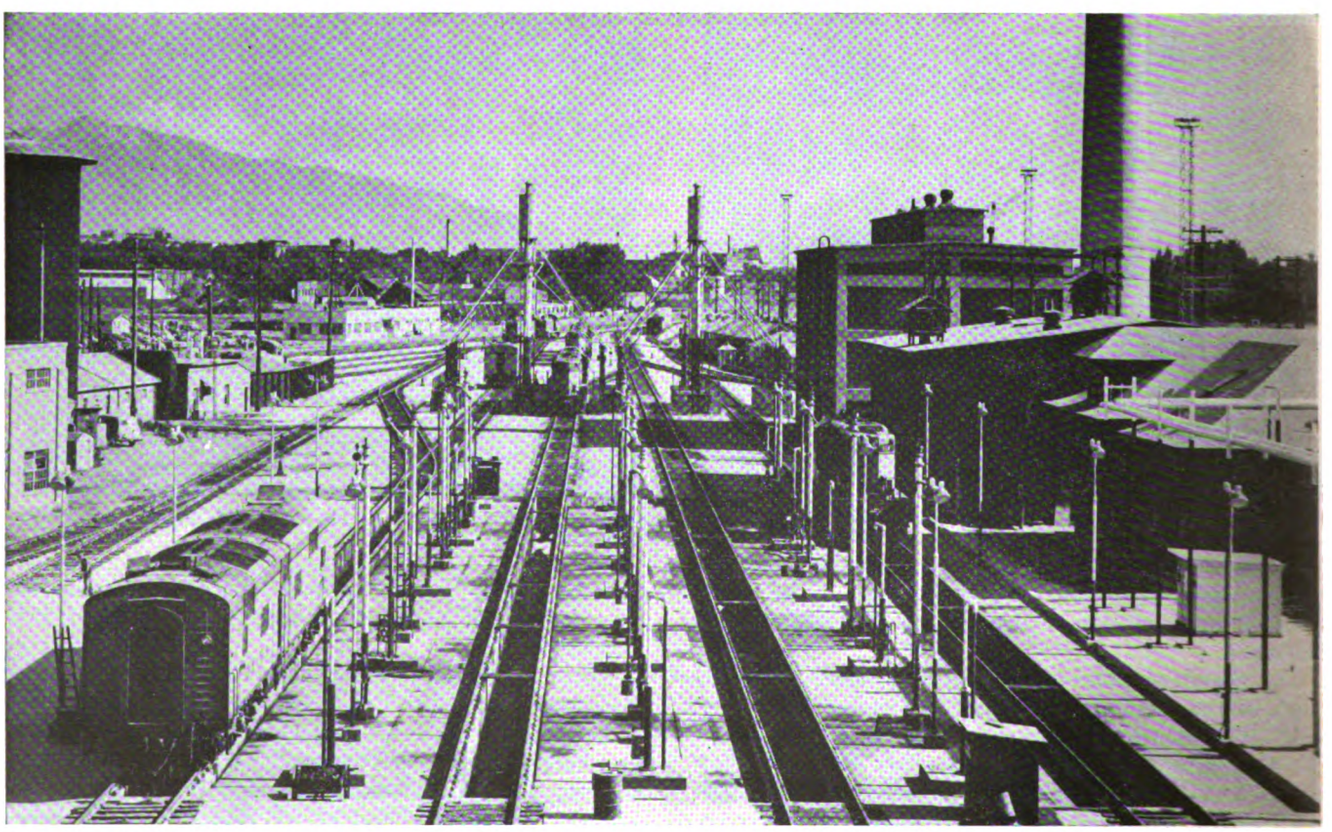


Machine used to spot locomotives on the wheel-truing machine. Electrically operated, it clamps itself to the rails and, with a rack and pinion arrangement, moves the locomotive to the desired spot.

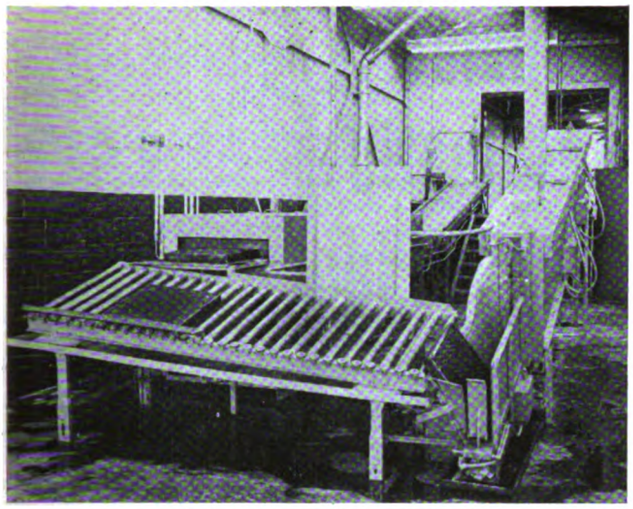
Heating System

The new shop heating system consists chiefly of unit heaters. In the shop areas, large industrial-type unit heaters, made by the American Blower Corporation, bring in 100 per cent fresh air. This air is brought to the final temperature of 110 to 115 deg F to furnish fresh air for the building. There are 43 of these units in the new structure, each bringing in 14,000 cfm of air and each having a heating capacity of 1,640,000 Btu. (In comparison, each heater would be large enough to heat 15 or 16 average-size homes.)

There are also 57 vertical discharge unit heaters, made by the Trane Company, which are used to supplement the heating in areas not requiring as much ventilation. They are also used around the large doors, heating the cold air which enters when the doors are left open. The office area of the new shop is heated by means of convector radiation. The convectors are Trane Company wall-type with sloping tops. All heating controls are of the Johnson Service Company pneumatic-type.



Servicing area of the new shop includes sanding towers and service pits for light servicing and fueling diesel and gas-turbine locomotives.



How air filters, coming out of the Farr washing machine, are upended to go through the dryer to the oiling unit.

Ventilation

Primary consideration was given to ventilation of the building because the diesel exhaust gases are highly toxic when concentrated. In order to assure quick exhaust of these gases, a series of hoods equipped with blowers are placed over each diesel unit service track. The roof ventilators attached to the hoods pull the gases up and out of the building immediately as they are expelled from the diesel units. The blowers may be operated singly or in banks. Other ventilators not connected to the hoods are placed about the roof to pick up gases which have escaped and risen to the underside of the ceiling. There are 109 power roof ventilators, each handling about 12,000 cfm and made by the Propellain Co., a division of Robbins & Meyers, Inc.

In connection with ventilation, it was found that the diesel engine exhaust gas and overhead heat made conditions so bad for operators of the 270-ton and 35-ton cranes in the heavy repair and running service bays as to necessitate operating 80 to 100 per cent of the forty 3-hp ventilating fans in this area continuously. The resultant noise level interfered with the radio and public address system, so the cabs of these two cranes were enclosed with plywood and glass, equipped with G.E. ¾-ton air-conditioning units and Motorola walkie-talkie equipment for taking cab signals from the crane director on the shop floor. The result is much reduced use of ventilating fans with attendant power saving, lower noise level in the shop and safer overall operation.

Other features

Special service lines go into each 11-ft platform from which the diesel units are serviced. There are 13 lines, including three water lines, two for oil, electricity and other items needed in the servicing of the unit. The outlets are located conveniently so mechanics may make quick attachment to the line needed. There is also access under each track to facilitate servicing.

All electric power is brought into the building underground and then handled for various needs through a sub-station in the building

Outside the shop, special sanding equipment permits sanding a four-unit diesel on each of four separate tracks simultaneously. Another outside installation permits pit servicing of fuel, water and other items on four tracks. This is also used for inspection purposes.

A special water-treating plant supplies water for Vapor steam generators. No painting is done in the shop. The new building includes complete toilet-locker facilities for workers.

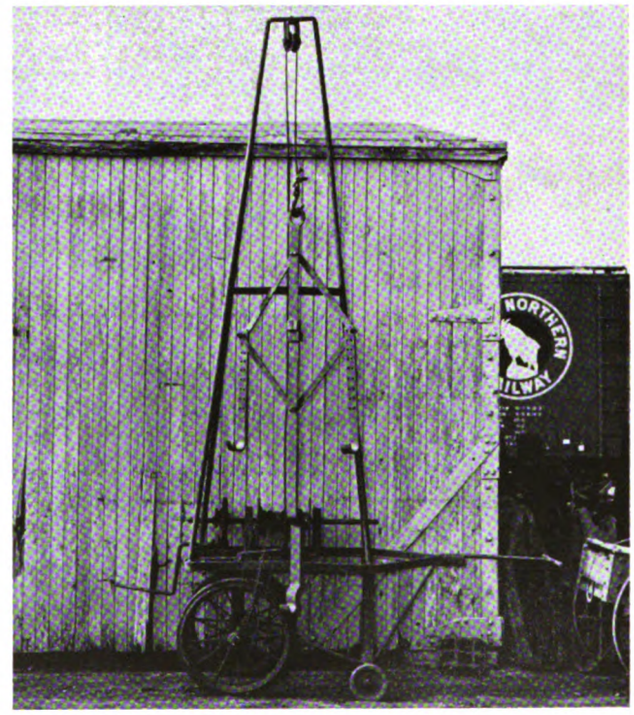
One feature of the shop designed to save steps and speed work is provision for storerooms on both levels of the shop. Items used primarily on the lower level are in the lower store and those used by mechanics on the upper level in the upper store.

Another machine-and man-hour saving device is the Motorola two-way communication equipment installed on three portable lift trucks, three chore boys, one service truck and one diesel locomotive crane. A radio transmitter located in the shop foreman's office enables a clerk to act as dispatcher for all of this important material-handling equipment and make sure it gets where needed in the shortest possible time.

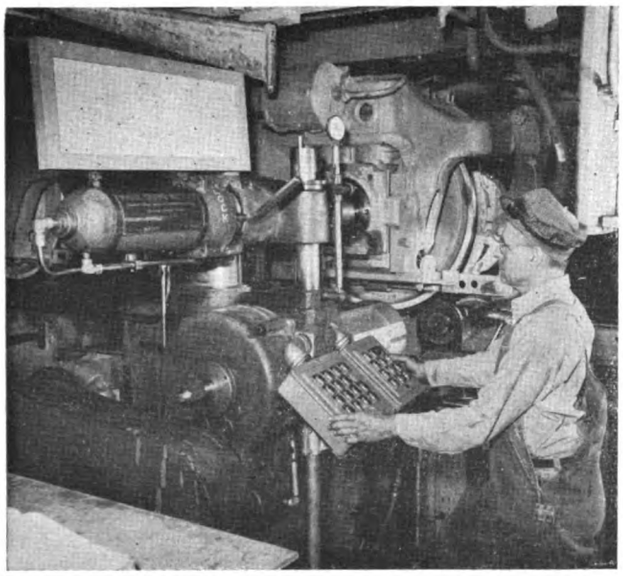
Door Hanging Device

A railroad built door hanger, can be used also for loading bales of cotton and other miscellaneous stores and bulk merchandise. For hanging doors, a hook on the bottom grips the bottom of the door while the two hooks on the side go around the vertical edges of the door.

The device is made of strap iron ⅜ in. by 2 in., angle iron 2 in. by 2 in by 5/16 in., and 1-in. pipe. The hanger portion is ⅜-in. by 2½-in. strap iron.



Hanger built for box-car doors can be used also for handling miscellaneous stores and bulk goods.



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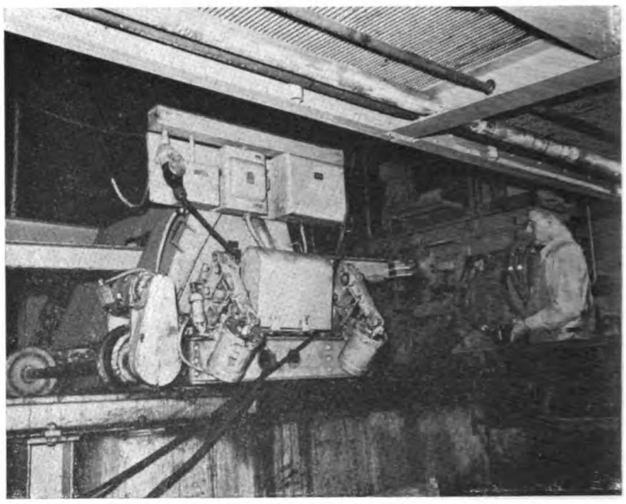

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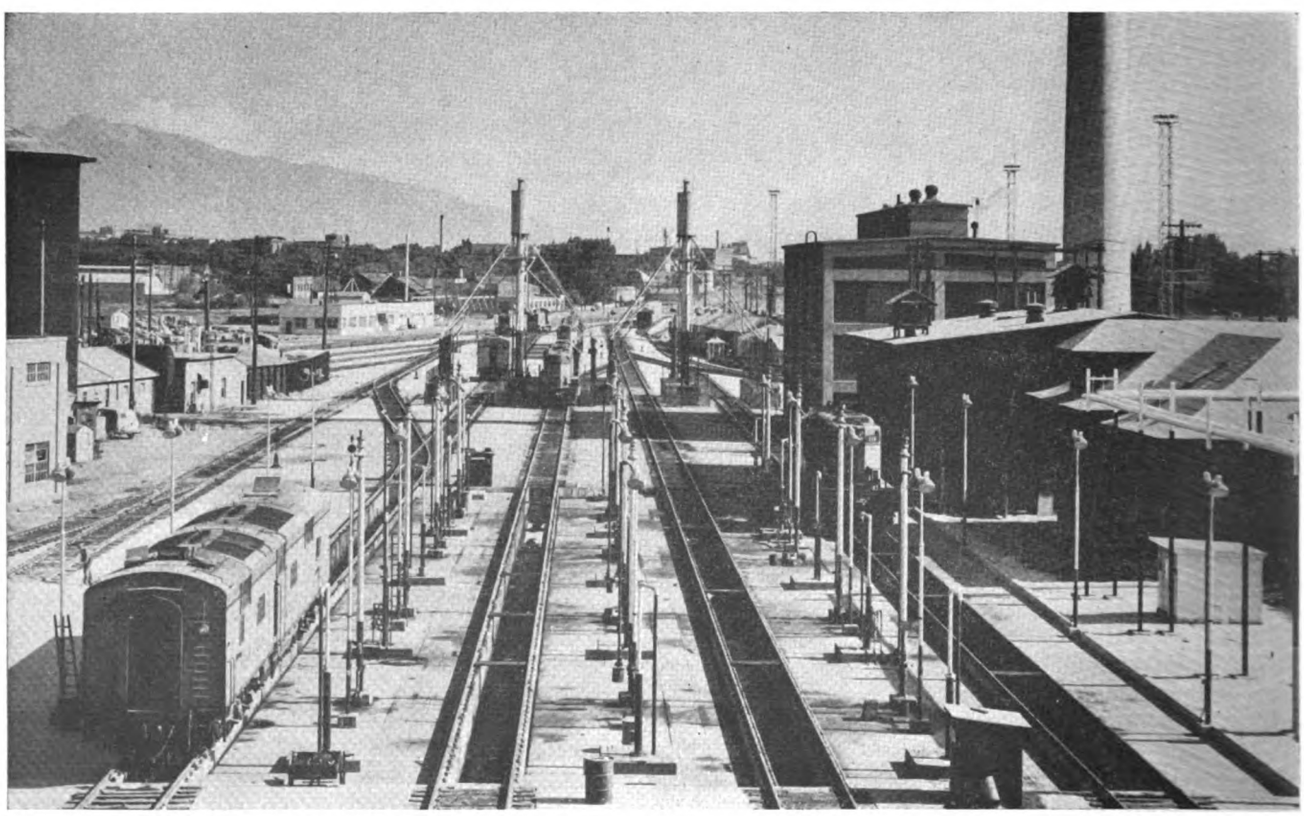

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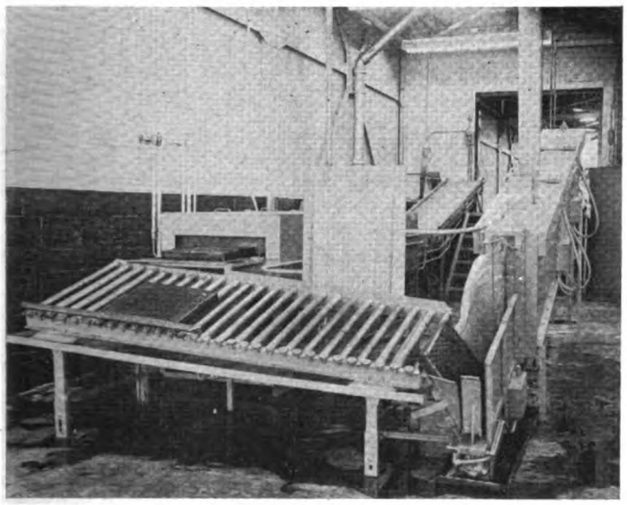

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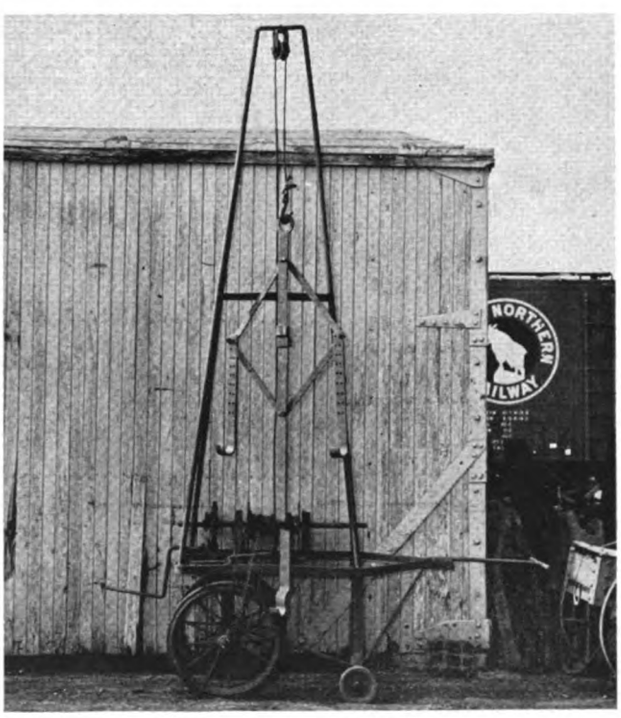

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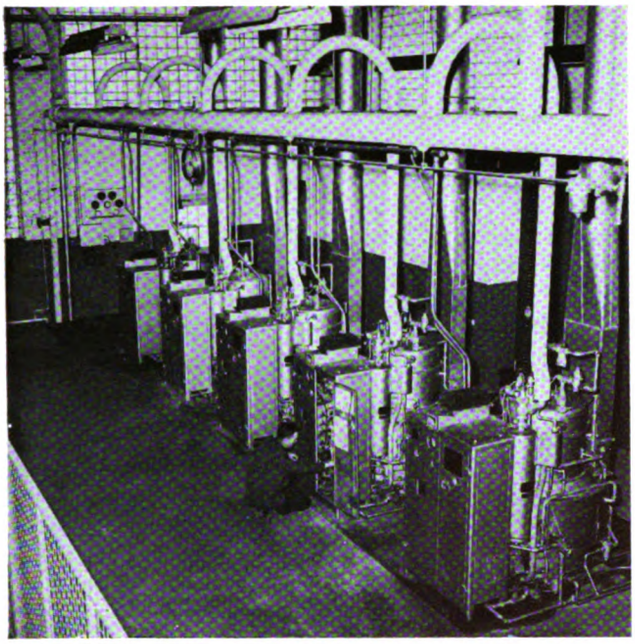
Completely Automatic Steam Plant



These five steam generators supply steam for cleaning, to make compressed air, and to . . .

Heat over 3 million cu ft of shop space indoors. Their output also . . .

Keeps 15 to 20 cars warm on the ready track in the cold winters of Sault Ste. Marie where 30 below is not uncommon.

A completely automatic steam plant has been put in service by the Algona Central at its Sault Ste. Marie, Ont., Canada, location of the main shops and offices. Five automatic Vapor-Clarkson, oil-fired, package-type steam generators were installed in a corner of the diesel locomotive shops to replace the older coal-fired boilers. This bank of automatic steam generators produces from 800 to 15,000 lb of steam an hour to meet the widely changing steam load of the shops. In the summer 800 lb of steam an hr at 80 psi pressure is used for steam cleaning locomotive parts and filters in the shops. In the winter up to the 15,000-lb capacity is needed to heat the 3,313,000 cu ft of space in all the shops and office buildings and railroad passenger cars on the outside ready track.

A master control turns one, two, three, four or all five of the steam generators *on* or *off* as needed to meet the changing steam load of the shops. On a cold winter morning, when it is 20 or 30 below zero, four or five steam generators may be used to heat the shops. When the sun comes out and the temperature rises, one or two of the steam generators may be turned off by the master-control, then on again when the temperature drops—both operations being automatic as explained in box.

How Conversion Was Made

After the old boilers, along with the coal and ash handling equipment were removed, the boiler room section of the diesel shop building was re-built, using large sections of glass block brick. A 4,000 Imperial gallon (4,800 U.S. gal) oil-fuel tank was bricked in at floor level with oil pipes from the larger tanks in the yards. A 3,000 Imperial gallon feed water tank was fabricated in the shop and placed at floor level next to the fuel tank.

All water, fuel-oil and blow-down piping to the five steam generators installed in front of the fuel and water tanks was placed in a drain trough trench behind the units. A metal grating covers the trench.

Steam from each unit goes into an 8-in. steam header (about 8 ft above the generators) from which the steam pipes for the different shop buildings are taken off. Steam is carried from the generators to the header through a 2-in. pipe with an expansion arch.

It was not necessary to build an expensive brick chimney. Instead, a steel exhaust stack rises from each steam generator and extends about 5 ft above the roof. The exhaust stacks do not have to rise high in the air to create a draft the steam generators have forced draft blowers.

A vacuum pump on the heating system returns all steam condensate in the system to the feed water tank, except the steam used to heat the 12 to 18 passenger cars outside and the steam used for hot jet cleaning. All feed water is zeolite treated.

How Steam Output Is Automatically Controlled

A master steam generator control automatically turns on or off the one to five steam generators as needed to keep 100-lb working steam pressure on the steam header. To put the automatic steam plant into operation only one steam generator is turned on manually before this master control on the wall in the background takes over and turns on as many of the remaining four as needed. Each steam generator then automatically varies its output by metering the fuel, air and water to make from 1,000 to 3,000 lb of steam per unit per hour, or total capacity from one to 15 thousand pounds an hour.

Here's how the control works. Assume it is 20 below outside and four steam generators are needed to heat the shops. During mid-day the temperature rises to five below so only three steam generators are needed. As the steam load gets smaller the fourth steam generator is shut down in the following sequence:

1. The fuel to the steam generator is shut off.

2. The steam generator motor continues to operate for five minutes to refill the coils with water.

3. The motor shuts off, leaving the coils filled with water ready to light up when the unit is again called on to make steam.

When the fourth unit is turned on, first the motor drives the water pump for 40 seconds to be sure water is in the coils. Then the fuel is turned on, a continuous spark insuring proper lighting of the fire. In case the fire does not lite up in a few seconds the unit is turned off to avoid flooding the unit with unburned fuel.

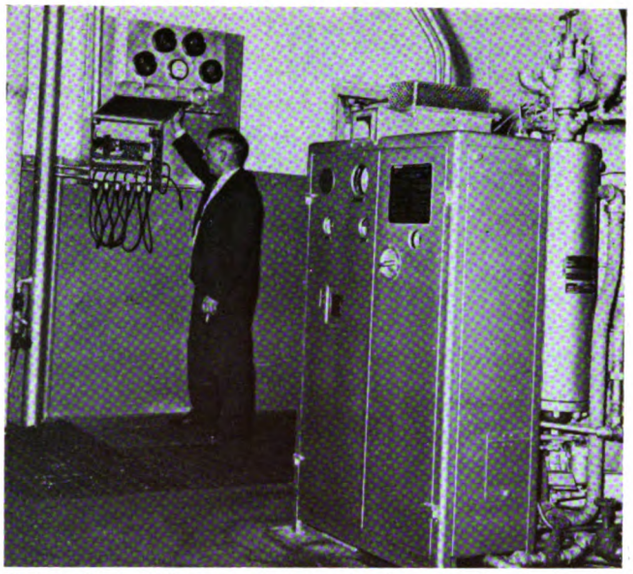
An alarm circuit rings a bell in case a unit does not light up properly. In this case, the unit is passed up and another unit turned on. Then an attendant can check the passed-up unit before starting it manually and putting it back on the line.

Control over cutting generators in and out is by the steam pressure in the header. Normally this is 80 psi. When the demand goes up, the first reaction is that this pressure drops. The drop causes the low-pressure switch to begin the sequence of operations to put another generator on the line.

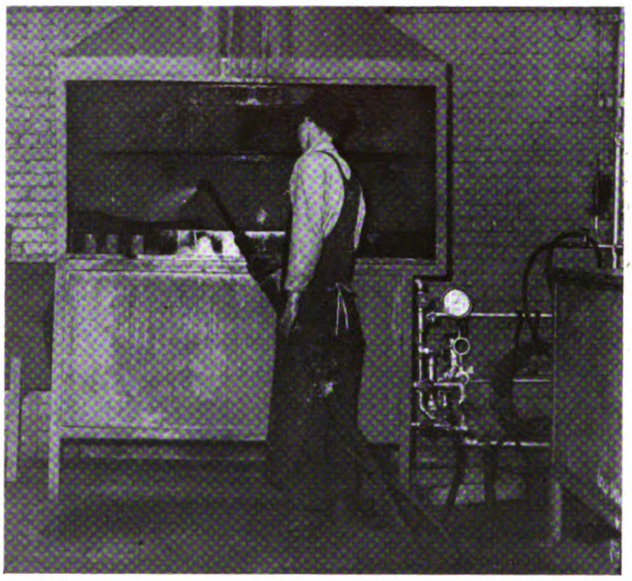
First, a master-timing motor shaft closes a switch feeding current to a unit-timer on the next generator to be put on the line. As the unit-timer motor turns, a cam closes a switch which turns on the motor driving the steam generator's water pump, blower and fuel pump. After the motor runs for 40 sec to pump water into the coils and purge air through the combustion space, the unit-timer actuates a second switch releasing atomized fuel-oil under pressure into the combustion space, which is lighted off by a continuous spark. Within 80 sec this unit develops 80-lb working steam pressure and produces up to 3,000 lb of additional steam per hour to handle the increased load, and the master timer then stops.

When the demand drops off, the pressure in the header naturally rises as more steam is being made than consumed. This causes the hi-pressure switch on the master control to start the master timing motor. Within two minutes the cam actuates a switch on the shaft feeding current to the unit-timer motor on the No. 4 steam generator. This shuts the solenoid fuel valve cutting off the fuel supply, but allows the steam-generator motor to continue to run two more minutes to refill the coils with water.

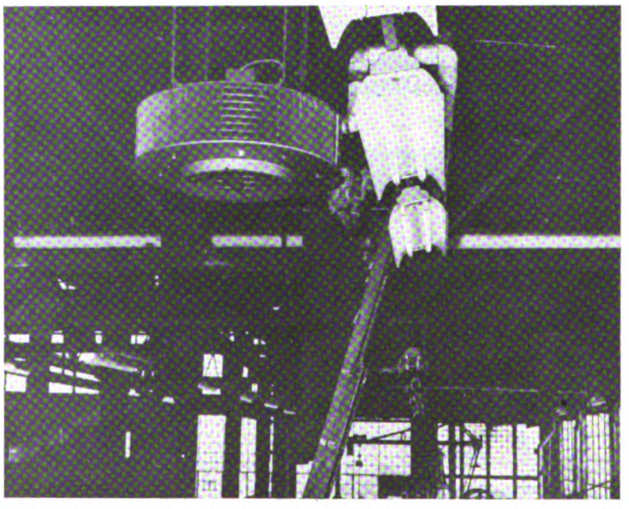
Blow down is also actuated automatically a few seconds every 15 min to remove the sludge in the steam separator.



One small control box starts or stops the five generators as necessary to meet changing steam demand

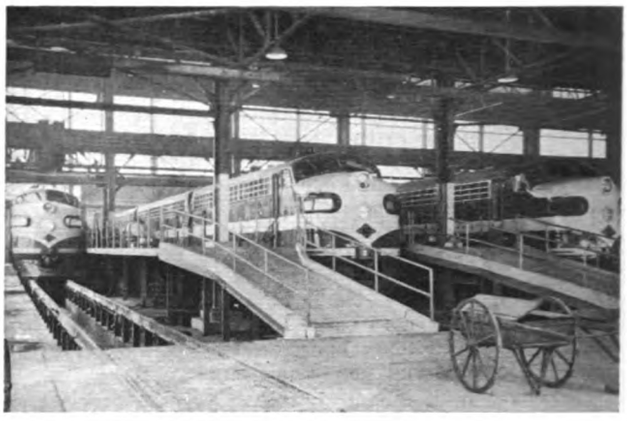


Steam is supplied at approximately 80 psi for cleaning and heating shop; at 50 lb for heating office and passenger cars on ready track



The space heaters are thermostatically controlled with a 2½-hp blower circulating air through the steam heated coils. Average height of the shop is 30 ft.

How to Plan A Diesel Shop



When the diesel electric locomotive came on the railroads in substantial numbers, the builders advocated separate facilities for maintaining them to avoid intermixing two types of power. This in the interest of cleanliness, and to provide a shop with features peculiar to diesel maintenance such as small overhead cranes, elevated platforms, depressed floors and the fuel, lubricating oil and water piping.

Some have not constructed any new shop buildings. Since most roads followed the builder's recommendation from the very start, in later years, as the number of diesels increased, the facilities first constructed were far from adequate. This necessitated expansion and alterations to keep pace with power acquisitions.

Later, it developed that some of these facilities were not constructed in the most desirable locations. At the same time the use of steam locomotives was diminishing and steam facilities gradually became vacant. Usually, these shops were well constructed and in good physical condition. In many cases they have been fully depreciated, so the taxation is lower than it would be for newly constructed shops.

This raised the question as to what should be done with the steam facilities. Consequently, railroad management changed its thinking and directed that thorough studies be made to determine how they could realize the fullest possible use of existing shop facilities, without spending large sums for new facilities.

It is this background and present day viewpoint that makes this subject of paramount interest to us, particularly in view of the fact that some roads are fully dieselized and those which are not, are rapidly approaching complete dieselization.

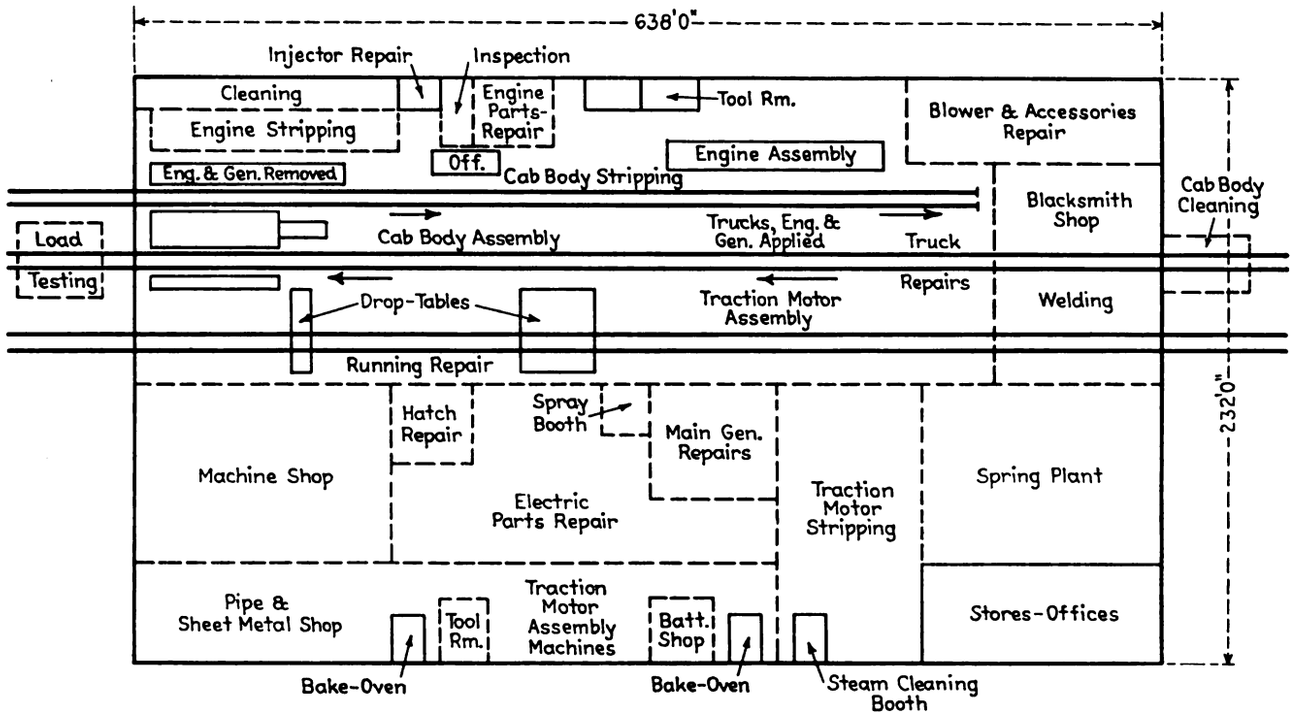
The use of diesel power allows extensive concentration

Advantages and Benefits Realized in Converting Existing Facilities

- **Eliminates need of constructing new buildings at present day costs.**
- **Existing buildings are depreciated; therefore, taxation is less.**
- **Heavy cranes for heavy work are adequate and purchase of new cranes is seldom necessary.**
- **Power plants are more than adequate for supplying heat, air and steam. Generally their capacity can be reduced.**
- **Existing electric power supply is ample, and changes are made at a low cost.**
- **Locker and wash room facilities are available.**
- **Administration and supervision offices are usually more than adequate.**
- **Fire lines and fire-fighting equipment is already on the property and approved by the underwriters.**
- **Public utility services have been installed.**
- **Employes are established in the community and its civic life.**

TABLE I—CONVERSION OF EXISTING STEAM LOCOMOTIVE SHOPS AND FACILITIES FOR DIESEL LOCOMOTIVE MAINTENANCE

TYPE OF SHOP	WORK TO BE HANDLED	PROVIDE SHOP SPACE FOR
General shops and supporting plant buildings, including transfer table, turntable, power plants and store buildings	Heavy classified repairs Light classified repairs Unclassified repairs Heavy accident repairs Annual inspections	Diesel engine overhaul Diesel engine sub-assemblies and appurtenances Heavy electrical rotating equipment Light electrical rotating equipment Electrical control equipment Locomotive carbody and accessories Truck and brake rigging repairs Air-brake equipment Wheel and axle, including journal roller bearings and boxes Various cleaning vats and tanks Locomotive painting Steam generators, if used Material dispensing adjacent to work
Division roundhouses, turntables and store buildings	Running repairs Periodical and ICC inspections Terminal servicing Change traction motors and wheels if not done at a general shop	Pits for underneath inspections Servicing Light locomotive repairs Removal and application of traction motor and axle assemblies
Small roundhouses, locomotive shelters, and other tie-up facilities	Turn-around and necessary ICC inspections Locomotive servicing, if length of run requires	To protect locomotives against weather, where climate necessitates Storage of minimum engine supplies and tools if needed



Layout for combined heavy and running repair shop.

of maintenance at a selected shop or terminal, thus permitting the closing up or retiring of many of the steam facilities at intermediate terminals. So, it is quite natural that a thorough study of the various locations must be made to determine which are the most advantageous to retain from operating and maintenance standpoints.

In selecting a location where facilities exist, consideration must be given to property values and taxes because in certain areas where values and tax rates are high, the entire facility, including the land, can be leased or sold for a price sufficient to justify construction of a modern shop on a location where values and taxes are less.

If existing facilities are in the location desired for diesel locomotive maintenance and the buildings are in good condition, they usually can be converted, with certain modifications, to handle all kinds of diesel work at a nominal cost.

Unneeded portions of buildings or ground area can be released for other railroad purposes, leased, sold or disposed of to the best advantage. This can result in reduction of taxes, provide additional income and locate another customer on the railroad property, and at the same time secure good returns from the investment.

It is difficult for this committee to make general rules for shop design because of the many variables in demands and limiting conditions. Heavy repair shops can, but need not be isolated.

Where only a few diesel locomotives are operated, the most efficient plan may be to combine the major overhaul with the running repair point at the same location. The heavy repair shop then becomes a major extension of a running maintenance shop. This combination provides the heavy overhead cranes for handling the units, but it saves space, supervision, labor, shop expense, dispatching, material handling and inventories. Machinery and equipment will serve for both operations and work can be coordinated. Employees may be used interchangeably on classified, unclassified and running repairs.

Types of facilities differ widely on the various railroads and in order to formulate wise decisions and to evaluate the diversified problems, individual studies have to be made of present versus that of erecting new facilities for diesel maintenance. In doing this, consideration must be given (1) to whether the buildings are best situated geographically; (2) whether the structures are of size and value to justify the conversion expenditures; (3) what are the supervisory and manpower problems, and is ample skilled labor available; (4) where is the source of material supply and what is the delivery time, because this affects material inventories.

In rearranging existing shops for diesel maintenance, a decision must be made as to what machinery, cranes, pits and tracks will be retained and what will be retired. Where shop machinery that requires heavy and expensive foundations is retained it should be left, if possible, on its present foundations arranging other work around such machinery to eliminate the expense of new foundations. This principle applies to existing pits, craneways and other structural features of the building that would involve considerable money to change or relocate.

Where diesel units are run inside the shops, provision must be made for adequate ventilation. Often this feature has been overlooked and later had to be installed at a much higher cost.

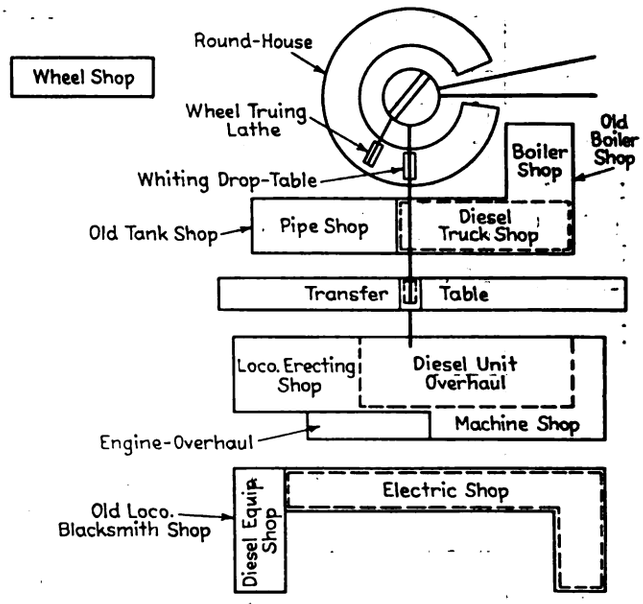
Generally, the larger steam facilities such as general shops are comprised of two main buildings with a transfer table between, and two or three supporting buildings located nearby. The main building in this group, which is the erecting and machine shop is ideal for heavy classified and accident repairs. The customary heavy machinery in this building used in steam locomotive maintenance is not required for diesel work and most of it can be retired. A large floor area was needed for this heavy machinery and its retirement releases sufficient space for rebuilding of the diesel engine, repairs to the diesel engine component parts and the electrical control equipment.

The building across the transfer table formerly used for boiler, tender, truck, blacksmith and heavy forging work may be a suitable shop for handling diesel trucks, main generators, traction motors, steam generators and storage battery repairs. A portion of this building can be made into a paint shop and another used for heavy underframe and car body structural repairs.

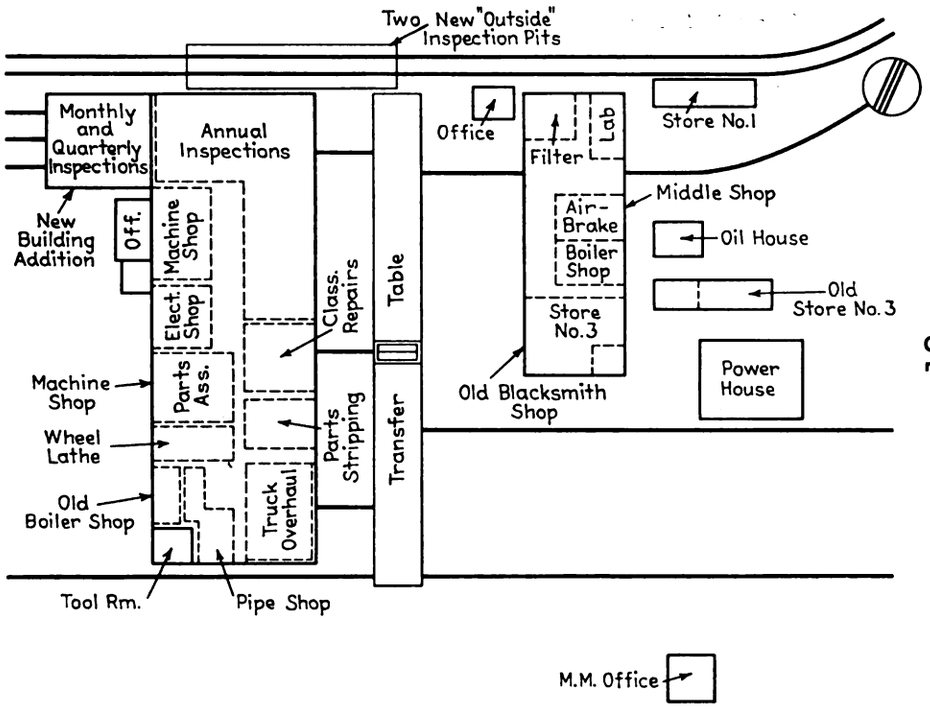
Air brake, wheel and axle, sheet metal and pipe work for steam locomotives was usually done in separate buildings adjacent to the two principal buildings. Corresponding work for diesel maintenance can be done in the same buildings or consolidated into the main building when there is ample floor space.

New machinery needed for diesel work if nominal and little floor space is needed, except when undertaking complete overhaul and rebuilding of main generator and traction motors. The machinery and equipment required to do this work involves a substantial investment and considerable shop space, and there should be ample room for maximum needs.

Consolidation and concentration of the repair and maintenance operations always provides the greatest use of property, machinery, tools, supervision and labor. This is not the case when work is spread out into various buildings which sometimes are far removed from the center of activities. Proper grouping for the various operations and maintenance work with good scheduling of work flow through the shop increases its productivity and affords better supervision with a minimum number of supervisors.



A shop layout where part of an old steam enginehouse is used in the heavy repair set-up.



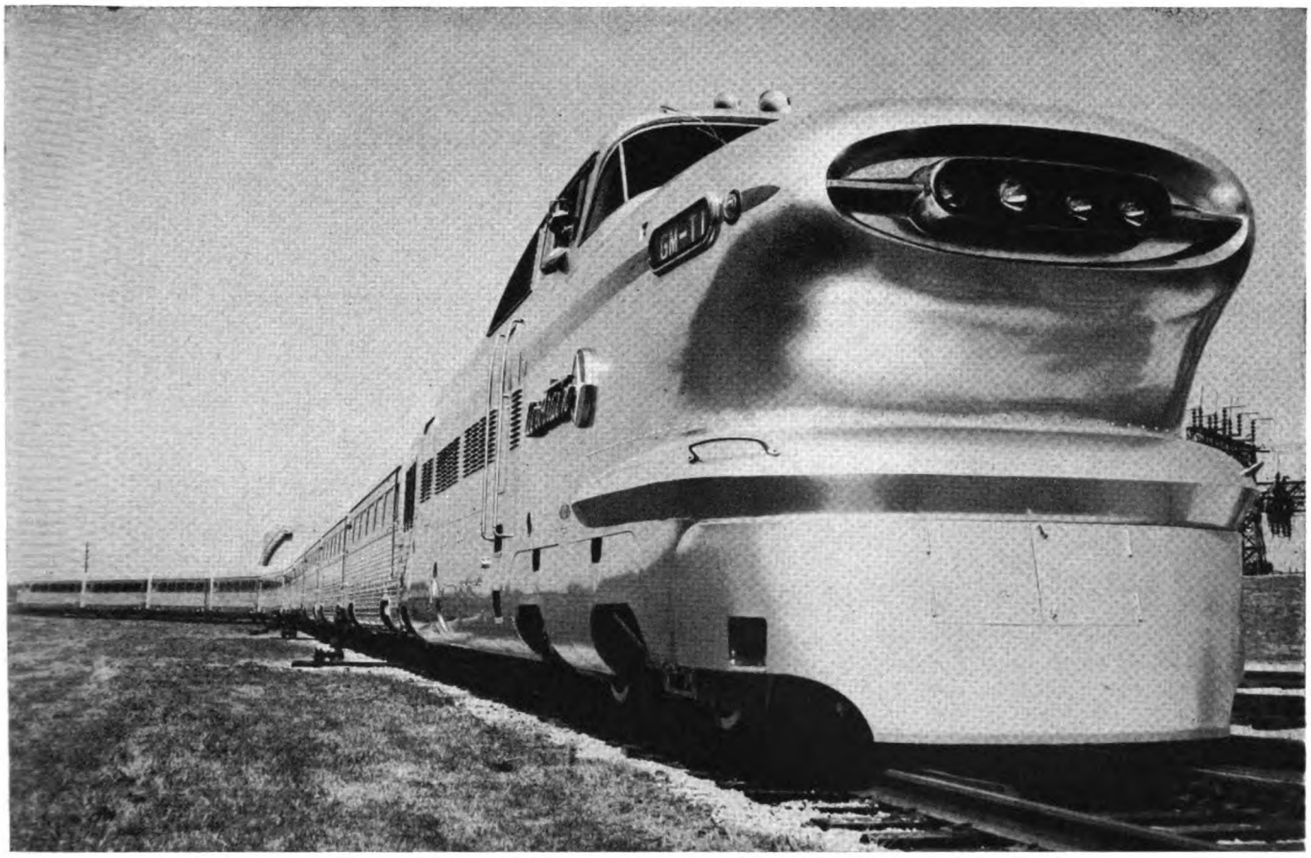
Outline diagram of combined heavy and running repair shop.

Railroads having few diesel locomotives have been able to consolidate their diesel work to the extent that it was entirely practical and economical to retire most of the roundhouses and retire others in part. Where a part of the roundhouse has been retained that portion has been adapted to diesel work by installing ramps, platforms, lighting, cupboards and necessary fuel, lubricating oil and water facilities.

Other railroads have utilized the existing roundhouses by filling in alternate pits, extending other pits sufficiently in length to accomodate two unit diesel locomotives, raised sections of the roof and made modifications to the buildings where necessary to increase the length of two or three tracks. Small turntables have been modified by adding knee brackets to each end of the turntable and modifying the turntable pit to suit, which has been done at nominal cost.

The size of the railroad, number and types of diesel locomotives operated, length of runs and type of service have direct relation upon what should be done with the existing steam facilities. The smaller railroads, usually

(Continued on page 61)



Radically different appearance seems to be the trend in the new concepts in lightweight train designs. Shown here pulling GM's new 10-car "Aerotrain" is the standard diesel unit which EMD will offer for all lightweight trains. This design of locomotive will also power the new "Jet Rocket", the Talgo-like speedster soon to be delivered to the Rock Island by ACF.

"Lightweight Train Day" at Chicago

Rock Island tests ACF Talgo at over 100 mph while GM reveals added details on new Aerotrain

A few weeks ago the same day saw the official christening of General Motor's new lightweight "Aerotrain" and high-speed test runs of ACF's prototype Talgo-like "Jet Rocket" to be delivered to the Rock Island in December to improve its Chicago-Poeria schedule. In addition to cutting in half the weight per seat compared to present equipment, the new trains have one other feature in common; both will be powered by the same design of locomotive which will be the standard unit which EMD will offer for all lightweight trains.

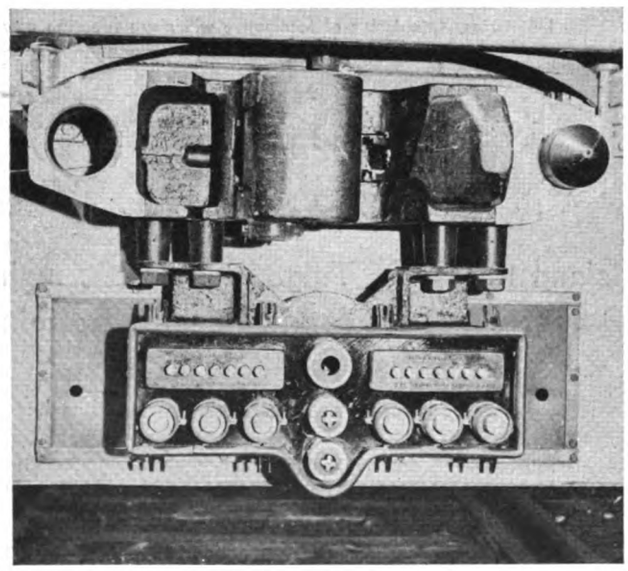
The single unit locomotive is 53 ft long and 13 ft 7 in. above the rail. It will be powered by one EMD engine with 1,200 hp for traction. The front four-wheel truck will be the driving truck with two traction motors. An idler axle with two wheels will sustain weight at the rear of the locomotive. Two Detroit diesel engines in the locomotive will operate generators to supply current for heating, lighting and air conditioning. The locomotive will have dynamic brakes, geared for top speed of 102 mph.

The Talgo train tested is a descendant of the well-known Talgo trains of Spain, which have accumulated some ¾ million miles of revenue service since 1946. It has been modified to fit U. S. railroad conditions. Floor height has been increased from 18 to 26 in. above the rails, width reduced from 10 ft 7½ in. to 10 ft 2 in., height raised from 9 ft 7 in. to 10 ft 10 in. and the length increased from 20 ft 2 in. to 34 ft 6½ in. per body unit. It is still, however, about 3 in. wider than a conventional car, 1⅔ ft lower and the floor 2 ft closer to the rails. Center of gravity is about 1½ ft lower than the 55-58 in. of conventional cars.

Weight per seat has been approximately doubled over the original Talgo, but the 800,000-lb buffing load and other AAR and RMS standards are met. Radially guided axles have replaced the old wishbone arrangement, permitting the cars to run in either direction, unlike the original Talgo which was restricted to one way operation.

During the 144-mile round-trip test run, the Talgo reached a maximum speed of 103 mph on straight track. Perhaps more significant, however, was the comfort with which the train took, at 85 mph, a curve on which present streamlined equipment is restricted to 70 mph.

The bins in the underframe serve as extra roomy baggage compartments for easy loading from station platforms. One bin contains the heating and air conditioning equipment.



The "Aerotrain" uses a new automatic coupling device, which in one operation joins air lines, power lines and control lines. Supplemental diesel engines in the locomotive will operate generators which will supply current for train heating, lighting and air conditioning. Talgo also has head-end power and automatic coupling.

Riding qualities of the new Talgo were comparable with the best of present equipment at high speed, although noise was slightly higher where the body units join. At very low speeds, up to 15 or 20 mph, rail joints were more apparent than with four-wheel truck equipment. The unit tested was, however, only a prototype of the new train to go into service on the Rock Island, and was built for test purposes to get out the "bugs" that are always found in any new design.

GM Train Rides on Air

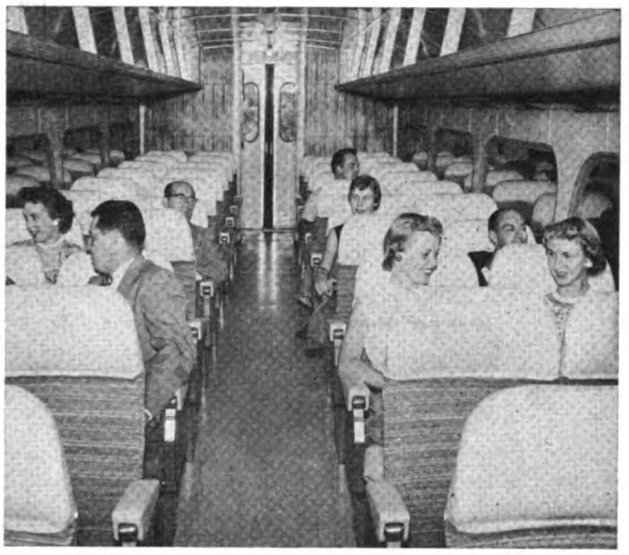
The most apparent difference between the GM train and the Talgo is that each GM car has a two-wheel truck on each end. The car body rests on these trucks through bellows-type air suspension rather than springs. The air suspension serves three purposes—to cushion impacts, to insulate against noise by breaking the through metal contact, and to keep the car both level and at a constant height. The latter purpose is served by admitting or releasing air from each of the four sets of bellows.

As passengers enter the car, causing the body to settle down, air is admitted automatically to each of the four bellows. In going around a curve at high speed, causing the body to lean outward, air would be admitted to the outside bellows the same as if the reduction in distance between the body and the rail resulted from increased load. At the same time, air will be released from the bellows on the side of the car toward the inside of the curve as this side tends to rise. The combined effect of the two actions is to keep the car floor parallel to curve elevation.

The body will be the 40-passenger GMC bus body widened 18 in. to give more comfortable seating space and a wider aisle. It is 40 ft long, 10¾ ft high and 9½ ft wide. The driver and engine compartment is replaced by a vestibule. One car end will contain a lavatory and pantry for serving meals. The other end will be a vestibule with entrances on both sides. The doors and steps are so arranged that the entrances will serve either high or low station platforms.

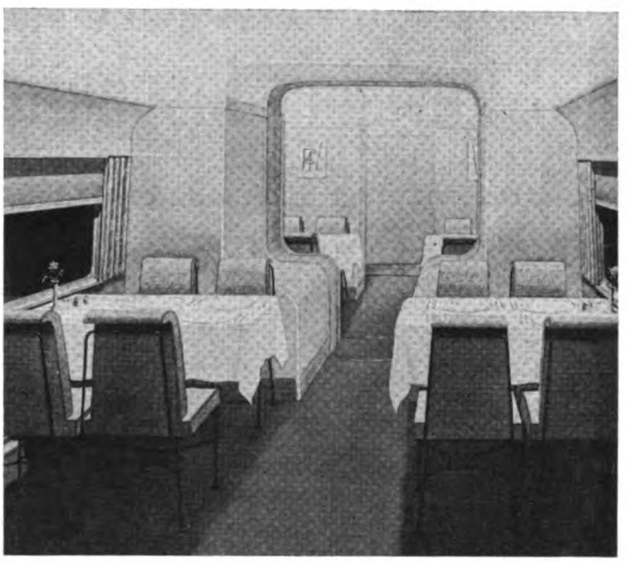
The body will be mounted on a bin-type underframe. One of the bins contains the heating and air-conditioning equipment. The others can serve as baggage and luggage carrying spaces. This construction concentrates the weight on the lower part of the car, giving a low center of gravity (45 in. above the rail) yet lets the passengers ride high.

The three articulated bodies joined together in the Talgo car, with the high and wide archways between, give added appearance of spaciousness. Overhead fluorescent lighting is supplemented with airplane-type reading lights over each seat.



The need for curtains is eliminated by the use of tinted glass in windows of the GM cars. Seats have metal backs and plastic headrests to cut cleaning time. Sliding doors are power-operated. Each 40-ft unit in the GM train has its own entrance.

Here is GM's idea of loading from either ground level or high level platforms. For ground level, entry steps are similar to standard construction, with drop apron. Exit from elevated platforms is facilitated by roof hatch, which swings upward to provide headroom.



The Aerotrain has a pantry in each coach for serving meals airplane style. The Jet Rocket has dining accommodations like present trains for 32. The Jet also seats 276 in the coach, 20 in the parlor car, and 12 in the beverage section.

Two of the GM 40-passenger cars are equivalent to one 80-passenger conventional coach but weigh 30 tons instead of 65, yet meet the same 800,000-lb buffing load requirements. When tooled for volume production, GM expects the new cars can be sold for $900 to $1,000 per seat, compared with $2,250 average cost per seat for present coaches.

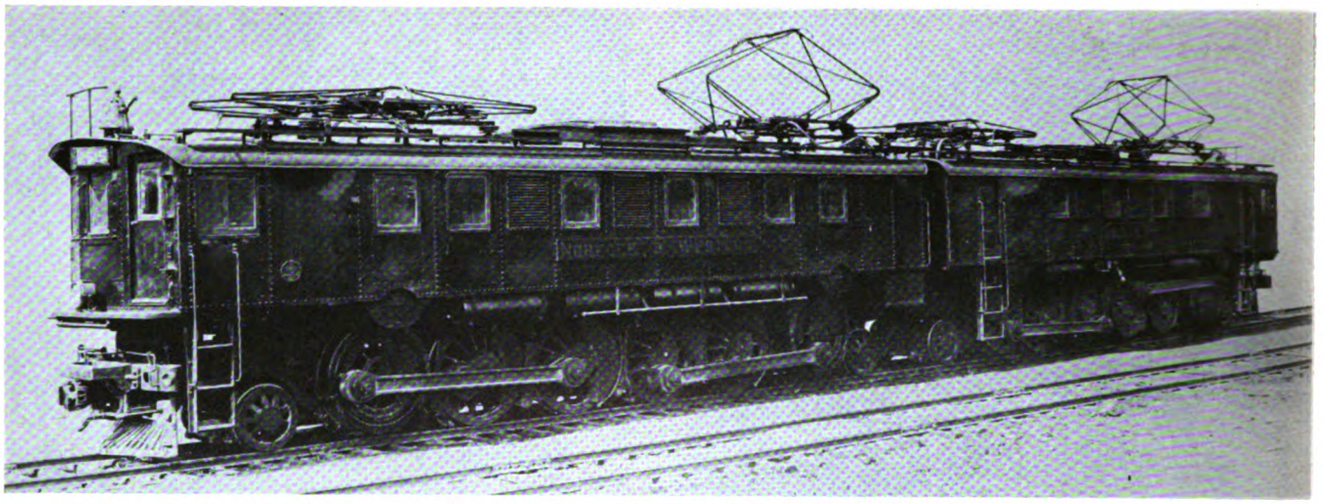
How the Trains Are Heated

The heating systems of the two trains have certain features in common and a number that differ. Both depend on electric heating in mild weather with current furnished by the locomotive, and both have a hot water heater for cold weather.

The Talgo cars have an electric overhead heating system and a liquid heating system for floor heat. The nonfreezing liquid medium is heated by a Vapor 4909 hot water heater that puts out 90,000 Btu per hour. One heater is installed in each three car unit of the train. It burns diesel oil and is turned on and off automatically to supplement the electric heat to keep the car comfortable.

The Aerotrain is heated by a liquid circulated through the radiation. The liquid is heated by electric immersion heaters on mild days with current from the locomotive. If the 12,500 Btu capacity of the electrical heat is not sufficient to kep the liquid medium at 160 deg, a Vapor 4915 hot water heater automatically lights up and heats the liquid as needed to keep the car warm. This heater

(Continued on page 61)



In 1924, "other-than-steam" meant this type of electric locomotive with steam type frame, large drivers and pilot trucks. As shown, multiple unit operation is not a new concept.

Already at the Proposal Stage . . .

ICC Revising Inspection Rules

Dieselization has made other-than-steam locomotive inspection rules the most important. When written, electric locomotives predominated but now electric locomotives constitute but a minor percentage of other-than-steam ownership.

Steam locomotives in service at mid-year were outnumbered three to one by diesel electric and electric locomotive units. At the same time, electric units in service were outnumbered forty to one by their "other-than-steam"partners. Yet today, the Locomotive Inspection Rules for Other Than Steam Locomotives, while covering electric locomotives, are inadequate in scope for Diesel power. Present rules were prescribed by an order of the Interstate Commerce Commission on December 14, 1925. Since that time there have been some revisions.

Up to the present, locomotives have undergone much more sweeping changes than have the inspection rules. Almost all diesel-electrics and most recently-built electrics have been mounted on four or six wheel swivel trucks. When these rules were originally prescribed, electric locomotives had steam-type frames and large driving wheels with separate tires. About a fifth of the revisions treat items that have arisen from the use of motored trucks and solid steel wheels. Dealt with are the maintenance of bolsters, center plates, solid wheels, brake rigging, slack adjusters, and box-to-pedestal clearance when there are no wedges. Cleanliness around trucks and wheels, and safety hangers for truck components and brake rigging are specified.

Changes in regulations relating to running gear are only part of a thorough overhaul of the inspection requirements. For six months during his interim appointment as Director of Locomotive Inspection, John A. Hall guided the preparation of 58 new and revised rules and instructions. These were first published on April 20, 1955. and are now scheduled for public hearings early in November. Only after this can the Commission take action to put them into effect.

Steam Generators Recognized

The modern steam generator has caused the largest number of changes relating to a single subject. Nearly one-third of all the revisions deal with this equipment. Components, controls and safety devices for the forced circulation boiler are listed for maintenance and test. Brake portions introduced with the newer air brake schedules are also listed for periodic testing.

Internal combustion engines and related equipment have brought problems which are covered in the only complete new rule which is proposed. Rule 262 would cover the "safe and suitable for service" maintenance of the diesel engine. It also would require that the engine be kept clean, and that its temperature and pressure alarms be properly maintained. Fuel tanks must also be clean, and they must be fitted with accessible cut-off devices. Exhaust from the engine must be discharged so

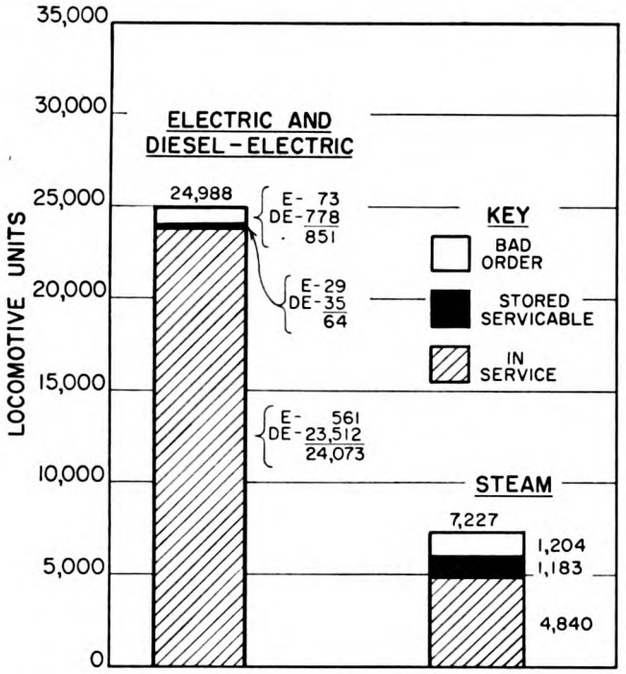
In 1955, "other-than-steam" means this type of diesel-electric locomotive. Trucks are used almost universally under diesel-electrics; most recently built electrics have them too.

that it does not enter the operating cab. The requirements about fuel tanks and exhaust are also applied to steam generators in separate rules.

Carbody and cab are the subjects of considerable revision. Shatter-proof glass would be mandatory in cab windows by 1957. Required by 1958 would be emergency

Here Are the Proposed Changes . . .

ICC RULE NUMBER	TYPE OF CHANGE		WHAT IS CHANGED?	WHERE COULD CHANGES APPLY?										
	New Requirement	Present Rule Rewritten		Units In Multiple-Unit	Controls-Air and Electric	Cab and Cab Equipment	Engine, Auxiliaries and Compartment	H. Volt. Electrical System	Fuel Tank and Fuel System	Carbody and Underframe	Brakes and Brake Equipment	Trucks and Wheels	Couplers and Draft Gears	Steam Generator and Controls
201 c	x	–	All control from one cab in mu	x	x	x	–	–	–	–	–	–	–	–
201 d	x	–	All wheel slips show in cab	x	x	x	–	–	–	–	–	–	–	–
204 b	x	x	Emergency brake valve	–	–	x	–	–	–	x	x	–	–	–
205 a	x	x	Control air reservoir	–	x	x	–	–	–	x	–	–	–	–
205 b	x	x	Add "load and unload"	–	–	–	–	–	–	–	x	–	–	–
205 f	x	–	Exclude oil from air system	–	–	–	–	–	–	–	x	–	–	–
208 a	x	x	Maintenance of brake equipment	–	x	–	–	–	–	–	x	–	–	–
209 b	x	x	Brake travel and slack adj	–	–	–	–	–	–	–	x	x	–	–
210	x	x	Brake equipment safety hangers	–	–	–	–	–	–	–	x	x	–	–
211 d	x	–	Control air leakage	–	x	–	–	–	–	–	–	–	–	–
212 a	–	x	Eliminates "between units"	x	–	–	–	–	–	–	–	–	x	–
212 f	–	x	Uses "automatic couplers"	x	–	–	–	–	–	–	–	–	x	–
212 g	–	x	Uses "automatic couplers"	x	–	–	–	–	–	–	–	–	x	–
212 h	–	x	Coupler wear limits	–	–	–	–	–	–	–	–	–	x	–
212 i	x	–	Imobilizing coupler locks	x	–	–	–	–	–	–	–	–	x	–
219	x	x	Box-pedestal clearance ¼-in	–	–	–	–	–	–	–	–	x	–	–
220	x	x	Add between boxes and pedestals in.	–	–	–	–	–	–	–	–	x	–	–
221 a	x	x	Bolster maintenance	–	–	–	–	–	–	x	–	x	–	–
221 b	x	–	Clean trucks, tanks, frame	–	–	–	–	–	x	x	x	x	–	–
222 c	x	–	Truck part safety hangers	–	–	–	–	–	–	–	–	x	–	–
223 a	x	x	Center plate maintenance	–	–	–	–	–	–	x	–	x	–	–
225	x	x	Add "sand pipe extensions"	–	–	–	–	–	x	x	x	x	–	–
226	x	x	Cleanliness of wheels	–	–	–	–	–	–	–	–	x	–	–
227 h	x	x	Add "cracked flange"	–	–	–	–	–	–	–	–	x	–	–
227 o	x	–	Forbids welding on wheels	–	–	–	–	–	–	–	–	x	–	–
229 b	x	x	Cab safety glass and door stops	–	–	x	–	–	–	x	–	–	–	–
229 d	x	x	Cleanliness of floors and deck	–	–	x	x	–	–	x	–	–	–	–
229 f	x	x	Ventilation of cab	–	–	x	–	–	–	–	–	–	–	–
229 g	–	x	Passage between units	x	–	x	–	–	–	x	–	–	–	–
229 h	x	–	Provide fusee container	–	–	x	–	–	–	–	–	–	–	–
229 i	x	–	Protected fan openings	–	–	x	x	–	–	x	–	–	–	–
232	x	x	Steps and rails—lamps and windows	–	–	x	–	–	–	x	–	–	–	–
247 a	x	x	Protection of jumpers	x	x	x	–	–	–	x	–	–	–	–
249	x	x	Clean high voltage electrical equipment	–	–	–	–	x	–	x	–	x	–	–
251	–	x	Cleanliness of resistors	–	x	–	–	x	–	x	–	–	–	–
255 b	x	x	Fuel cut-off (See 323 b)	–	–	x	x	–	x	x	–	–	–	–
259	x	x	Exhaust stack height—See 327	–	–	x	–	x	–	x	–	–	–	–
262 a	x	–	Engine maintenance and operation	–	x	–	x	–	–	–	–	–	–	–
262 b	x	–	Cleanliness of engines	–	–	–	x	–	–	–	–	–	–	–
262 c	x	–	Maintain engine controls	–	x	–	x	–	–	–	–	–	–	–
303 b	–	x	Excludes forced circulating boilers	–	–	–	–	–	–	–	–	–	–	x
307 c	x	–	Test of boiler controls	–	x	–	–	–	–	–	–	–	–	x
308 a	–	x	Specifies "exterior surfaces"	–	–	–	–	–	–	–	–	–	–	x
308 b	x	–	Control test after storage	–	x	–	–	–	–	–	–	–	–	x
316 a	x	x	Safety valve discharge	–	–	x	–	–	–	x	–	–	–	x
317 a	–	x	Excludes forced circulating boilers	–	–	–	–	–	–	–	–	–	–	x
317 b	x	x	Discharge of drains	–	–	–	–	–	–	x	–	–	–	x
317 c	x	x	Add "fill-test valves"	–	–	–	–	–	–	–	–	–	–	x
317 g	x	–	Drip pans for gage cocks	–	–	–	–	–	–	x	–	–	–	x
317 h	x	–	Visual water return indicator	–	–	–	–	–	–	–	–	–	–	x
317 i	x	–	Fill-test valve on steam generator	–	–	–	–	–	–	–	–	–	–	x
320 b	x	x	Add "fill-test valve"	–	–	–	–	–	–	–	–	–	–	x
321 d	x	–	Extra strong piping in cabs	–	–	x	–	–	–	x	–	–	–	–
321 e	x	–	Defective boiler marked	–	x	–	–	–	–	–	–	–	–	x
323 b	x	x	Fuel cut-off (See 255 b)	–	–	x	–	–	x	x	–	–	–	x
327 a	x	x	Exhaust stack height—See 259	–	–	x	–	–	–	x	–	–	–	x
327 b	x	–	Remote boiler ignition	–	x	–	–	–	–	–	–	–	–	x
334	x	x	Brake cleaning after storage	–	–	–	–	–	–	–	x	–	–	–

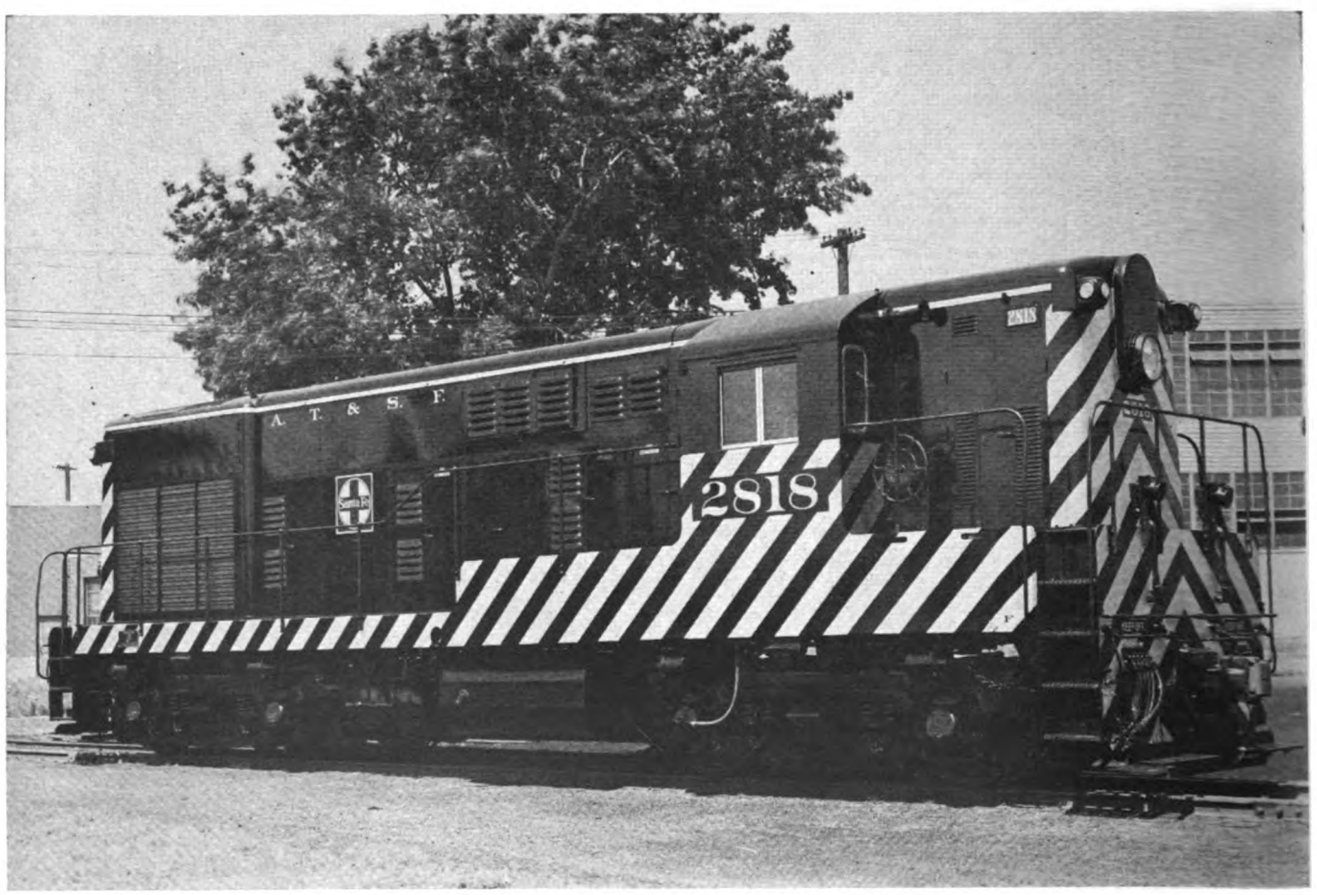


Locomotive inventory reported by AAR shows position occupied by declining steam on July 1st. The 24,325 diesel electric units are rated as 17,607 locomotives by their owners. The 572 electric locomotives have 663 units.

brake valves at the fireman's station in the cab and beside the end doors of all carbody-type units. Steps and handholds necessary to reach and service cab windows, headlights, marker and classification lights, and trolleys and pantographs would be mandatory. All fan openings on the locomotive would have to be adequately guarded. Extra-strength steam piping and adequate ventilation would be required in all cabs. The ICC's emphasis on cleanliness applies to all flooring and decking along with the running gear, fuel tanks, underbody and diesel engine.

Multiple-Unit Changes

While multiple-unit operation has long been an accepted practice on electric railroads, regulations dealing with it will be much more specific if the rules revisions become effective. Complete control of all coupled units from the operating cab would have to be assured. Wheel slips on all units would have to show in the controlling cab. The popularity of greater flexibility achieved by using automatic couplers instead of drawbars between units has been recognized by several rules revisions. The rewriting of the Locomotive Inspection Rules was brought about by the diesel electric, but its requirements, old and new, would apply to electric locomotives. Previous treatment of electric traction equipment seems to have been quite complete because only two minor rule revisions have been proposed.



Road switcher, such as this Santa Fe unit, evolved after the introduction of the diesel-electric. Equipped with steam generator and fitted for multiple unit operation, these locomotives can fill almost any railroad assignment. Recently the Virginian has ordered electric locomotives to be built as road switchers. These Virginian units will go into service during 1956.

"Lightweight Train Day"

(*Continued from page 57*)

puts out 150,000 Btu, burns diesel fuel and is installed in a luggage type of compartment under each car. The oil heater does not supplement the electric heat—when it cuts in, the electric heat is cut off and the oil heater takes the entire load.

Starting with a cold car just brought in from the yard, the division of load between the oil and the electric heat is as follows: First the oil heater takes over the load completely to raise the temperature of the liquid medium to 160 deg. It then cuts off automatically and the electric heat cuts in. It will stay on either unit the liquid is raised to 170 deg—if the capacity exceeds the heat loss to the outside air as it would on a mild day—or until the temperature falls to 150 deg, as it would on a cold day. Then the electric heat cuts off completely.

In either event, the next step is the oil heater cutting in. It does this immediately when the liquid temperature drops to 150 deg. On mild days, however, when the liquid climbs to 170, no heat from either source is added during the period when the temperature is falling from 170 to 150 deg.

The electric heat is either full on or full off. It is not modulated. The reason is that the 12,500 Btu put out by the electric heaters is but a fraction of the total required. It is, therefore, somewhat in the category of a modulated amount in itself.

It is GM's intention to release this train and a second exactly like it for test and demonstrations about Nov. 1, one to the PRR, the other to the NYC. Thereafter, one train will be made available to Eastern railroads, beginning with the New Haven, and the other to Western roads, commencing with the Santa Fe. First revenue service contemplated is between Chicago and Detroit by the NYC next Spring.

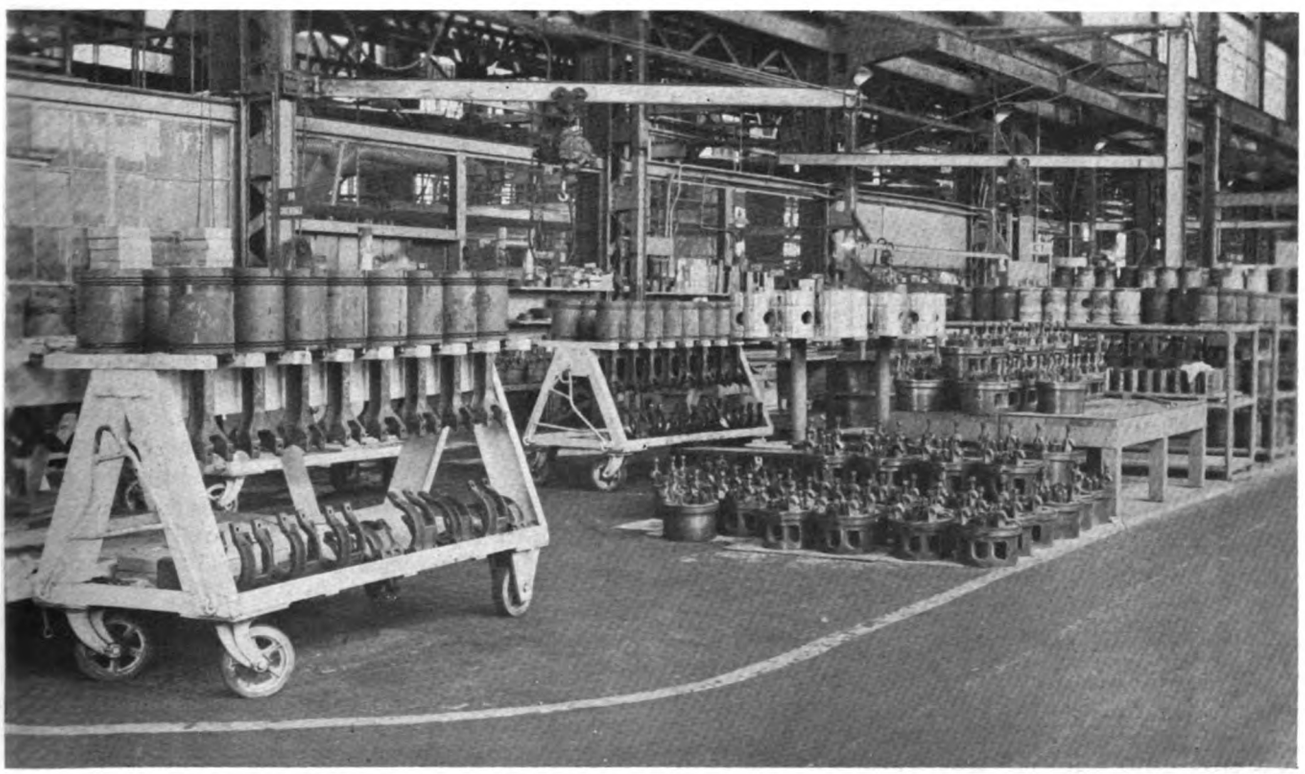
How to Plan A Diesel Shop

(*Continued from page 54*)

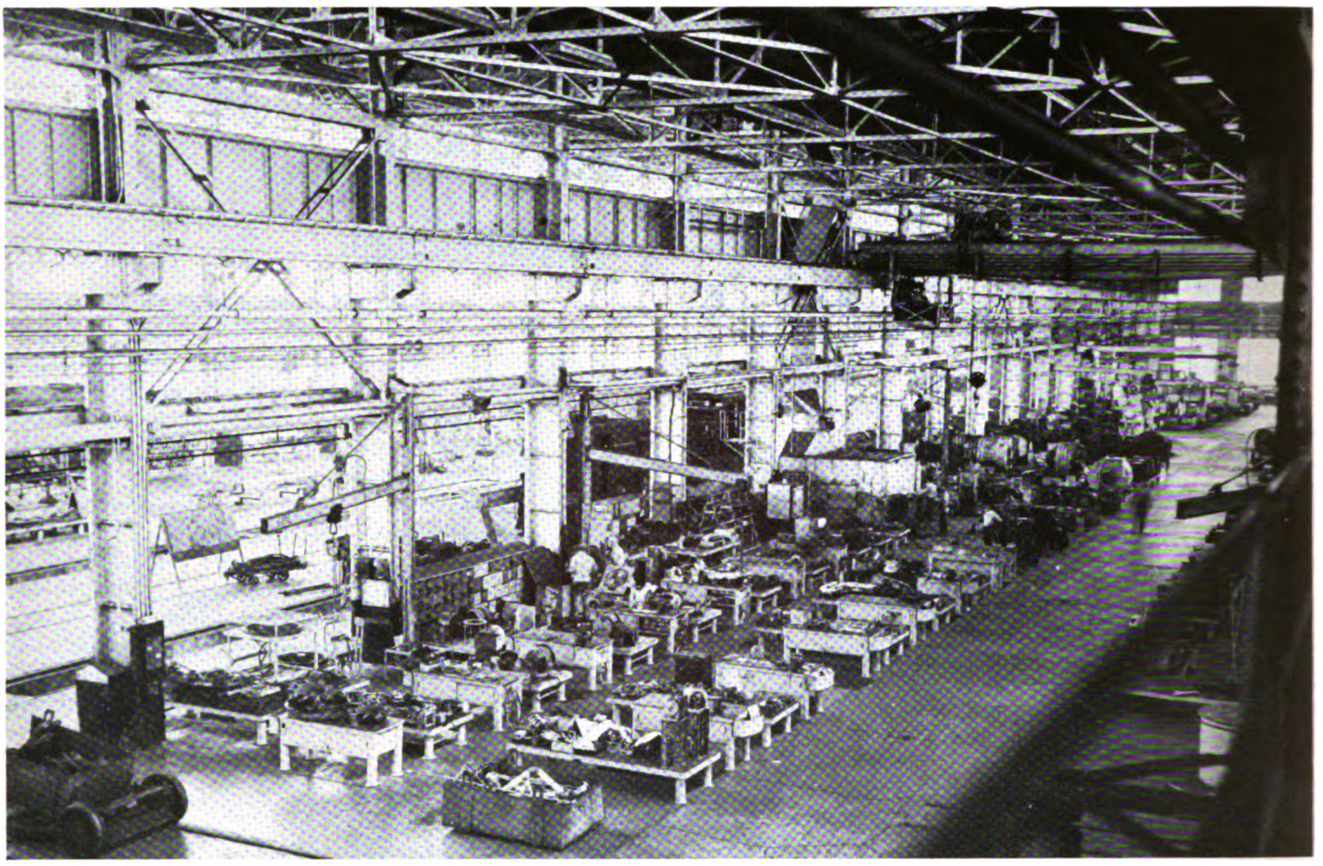
do not have the work volume to justify the shop conversion costs, and the purchase of the required machinery and tools. In such cases it is probably a more economical plan to use the locomotive builder's services and abandon their own for other purposes.

Some railroads have sufficient diesel power to justify one heavy maintenance shop and abandon all others. In the smaller size shops, the customary power plants can be replaced with small industrial steam generators or a standard one used on diesel locomotives.

This report was an annual meeting presentation of the Shop Planning Committee of the Locomotive Maintenance Officers' Association. R. E. Harrison, Southern Pacific was chairman.



Good housekeeping generally means good workmanship—Santa Fe diesel shops, San Bernardino, Cal.



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Planned Locomotive Maintenance

L.M.O.A. offers positive electrical and mechanical locomotive maintenance program which can be adapted to the needs of individual railroads

■ The Locomotive Maintenance Officers' Association Committee on Diesel Maintenance, at the September 12-14, 1955 meeting, held in Chicago, offered a planned locomotive maintenance program which could serve as a guide to member railroads. The plan does not cover work in detail, but rather emphasizes the importance of planning. The findings of the report were obtained through observation of practices on several railroads, from the study of numerous reports and from test results. In producing its findings, the committee has concluded that it is desirable in the interest of simplicity to present a maintenance program covering a single type of locomotive. The EMD F-7 and F-3 locomotives were selected for this purpose and it is believed the program may be adapted to any locomotive, whether 25 or 300 units are involved. The following is an abstract of it.

A positive maintenance program is, and must be, a planned program. For a starter the manufacturer supplies a maintenance program. This is very helpful and should be used until, and only until, enough experience is gained and some records are accumulated.

The experience gained and the records of road failures and defective parts removed, including their service life, plus test periods of individual components, will be most valuable in planning and administrating a positive maintenance program.

There is very little danger of a fleet of locomotives getting in bad mechanical condition during test periods to determine the frequency each device or part should be serviced. It is very important that lubrication schedules be watched closely.

Starting with a new locomotive or one overhauled, all parts or components are considered as having zero

service mileage, and as each part or device has a predetermined service life expectancy, only light running repair and inspection should be necessary before two years.

Planning on this basis 24 monthly maintenance sheets are made up (numbers 1 through 24), the work load on these 24 sheets is well balanced and the number of items is kept to a minimum. Careful study is given each item on the sheets, first to determine for sure that the work is necessary and, if so, at what frequency. Next, care is taken to distribute the work on the sheets in order to keep two or three men from working in the same location during the same maintenance period.

Each item of work listed on the sheets must be done at the specified time, and not deferred. Deferred work will accumulate and eventually unbalance the schedule. If each item of work to be performed is listed at the proper frequency the chance of failure is kept at a minimum.

At the time this cycle of the work has been completed, all 24 sheets have been used, over a 23- or 24-month period, a minimum amount of work and inspection has been performed, and the locomotive has been out of service a minimum amount of time.

As we cannot expect the locomotive to perform indefinitely without heavier maintenance work and as this is the scheduled time, the locomotive is shopped for some heavier than usual work. However, we still consider this work as running repair or work to be done at a running repair shop.

At this shopping, work included is renewal of power assemblies, scavenger blowers, oil coolers, governors, cleaning hatch, inspection of radiators, renewal of air compressor cylinders and pistons and tightening of the entire engine.

The electrical work done at this time is a complete and thorough cleaning and inspection of all electric cabinets, cleaning of main generators, alternators, slip rings and terminal block, painting of riser- and creepage-surfaces and servicing of storage batteries.

After the above work has been completed, the locomotive is load tested and returned to service for another two-year cycle identical with the first cycle except for a main bearing inspection which is made each three years.

Two years after the second cycle, the locomotive goes to the heavy overhaul shop for complete overhaul including engine, main generator, all electric equipment, trucks and car body.

The time elements and the number of maintenance sheets used in this illustration of the program planning is based on locomotives in heavy maintenance service where fuel consumption and the load factor are well above the national average.

It remains that each individual railroad must determine the most economical time or service life before power assembly renewal, as the power assemblies are the best and surest guide to use in building a maintenance program. They should be the controlling factor.

After the service life of power assemblies has been determined, then all other routine items of work and inspections should be divided over the number of months, and the same number of sheets printed as there are months between assembly change out.

For illustration, should thirty sheets be used over a period of thirty months, then on the same basis, the overhaul time would be extended to seven and a half years, instead of six years used in the preceding illustration.

Also included in this program is a book of Standard Procedures. The purpose of this book is just what the name implies, that there will be standard procedures to follow in detail, explaining how each job or inspection itemized on the maintenance sheets will be done.

The success of any positive maintenance program is dependent upon the care exercised by the supervisors of such a program to insure that all factors affecting the program are faithfully and properly carried out. We are all familiar with the old proverb which has its opening theme, "For want of a nail, the shoe was lost," and ends with the fact that the battle was lost. This same philosophy applies to a positive maintenance program. There are many factors which affect the success of such a program. Although some of these factors are simple ones, they all must be applied properly, or else the program will not be successful. The committee, therefore, presents a review of some of the major factors which assist in promoting a successful positive maintenance program—in fact it goes a long way in building the program.

Brushes

Use of proper grade and quality of brushes on diesel-electric locomotive main generators, traction motors and auxiliary is important. The extensive brush testing on locomotives over the past ten years by equipment and brush manufacturers as well as railroads, demonstrates that locomotive brush requirements differ from the needs of the electrical industry in general. Early diesel brushes were of the same grade as used on mill motors and similar industrial equipment. Today, the most generally applied brushes are those developed specifically for railroad use, by a few brush companies.

All the problems are not yet solved. This is due partially to changing speed and load requirements of modern railroading and partially to the fact that squeeky wheels get the most grease. As long as main generators and traction motors needed prime attention, auxiliary equipment received less attention. Now that good grades are available for most of the big equipment, auxiliary equipment problems can get better attention.

Brush company technical people say there is no direct relation between measurable physical properties of carbon brushes and their exact performance on commutators. There are general relations such as the highest electrical resistance in a series of similar grades that will probably be the best commutating grade. But two high resistance grades made from different raw materials or by two different processes will not commutate the same. The real test of a brush is how it works on a machine.

Proper brushes should have the following operating characteristics:

1. Ability to ride and commutate on commutators of reasonably maintained equipment under all railroad load and vibration conditions. A good brush grade will develop a good film on the commutator.
2. Strength enough to give full brush life without breakage.

3. Low friction and low commutator wear over wide range of electrical loading.

4. As long a life as possible without causing commutator wear or interfering with commutation and friction.

Sealed grease traction motor bearings are proving advantageous and bring about considerable savings in maintenance over the oil type, which have to be serviced every maintenance period.

Flashovers

Flashovers are a major problem in a running repair program, and very little progress is being made towards their elimination.

We believe that a lot of our flashovers are caused by momentary control circuit interruptions. These interruptions can take place at a number of interlocks and switches, therefore, we recommend that closer inspection and adjustments be made of all interlocks and switches. The new enclosed interlocks should go a long way towards correcting these failures.

Circuit interruptions can and do take place in control jumper cables. The new hose and loose or free wire cable should improve this condition, also a very light film of lubricant wiped on the receptacle contact point will be helpful.

Lubricating Oil

In any successful positive maintenance program, the use of a heavy duty diesel engine lubricating oil is a must. It has been said that the lubricating oil is the life blood of a diesel engine. Poor quality lubricating oils may fail to provide satisfactory oil films between moving parts and thereby permit to metal-to-metal contact, which manifests itself in the form of galled surfaces and excessive wear, necessitating premature replacement of the engine component parts.

In addition to preventing wear between moving surfaces, the lubricant in a diesel engine is required to serve as a coolant. It must carry away heat generated by combustion of the fuel from many of the component parts in the locomotive. In its role as a coolant, the lubricating oil is subjected to high temperatures and high pressure in the presence of oxygen. It must be so refined and so fortified with suitable additives that it will resist oxidation and the tendency to form sludge and deposit lacquer and other oil oxidation by-products on the various engine components.

The use of other than top quality heavy duty railway diesel engine lubricating oils may accelerate the wear and engine deposit accumulation to such an extent that a positive maintenance program can be seriously dislocated due to premature removal of engine components.

Filters and Screens

Although a high quality railway diesel engine lubricating oil will provide the greatest assistance in maintaining internal engine cleanliness, it must be given every assistance in performing this task. This assistance must be provided by first reducing to the minimum possible, contamination of the lubricant by extraneous contaminants, and secondly, by removing contaminants by efficient oil filtration. A primary source of extraneous contamination in a diesel engine results from air-borne dust. Although the percentage of dirt in the intake air may amount to only a few tenths of a per cent, the tremendous quantity of air consumed by the engine in operation results in hundreds of pounds of air-borne dirt being passed through the combustion chamber.

This dirt is frequently abrasive in nature and, therefore, causes wear in the combustion chamber as manifested by wear on the piston ring, piston ring grooves and cylinder liners. Frequently, the dirt works its way past the rings into the crankcase of the engine where it is then distributed by the oil throughout the engine system.

Early railway diesel engines were equipped with oil type impingement filters on the engine air intake alone. In order to improve engine air filtration, car body filters were subsequently added. Continuing research to improve air filtration has lead to the development of dry centrifugal and oil bath engine air filters.

These latter designs of filters are substantially more efficient than the oil impingement type filters. Although their cost of application is higher, test data indicate that considerable savings may be realized due to reduction of ring and ring groove, piston skirt and liner wear. Furthermore, the equipment has been so designed as to reduce substantially, or practically eliminate, any servicing. Hence, the increased cost of application is frequently offset by the elimination of routine maintenance.

In order to assist the diesel engine lubricating oil in performing its task, it is of utmost importance that the lubricating oil be kept clean and free of foreign materials. In addition to the sand and dirt which may enter the diesel engine lubricating oil through the combustion chamber, there are many other contaminants which are introduced into the oil as a result of maintenance work performed on the engine. Such items as lace wire, welding spatter, metal shavings, broken light bulbs and light bulb filaments have been found in the lubricating oil. Small strings or lint from wiping rags will combine with metallic particles into small balls that may cause piston-cooling pipe stoppage and piston crown failures.

Bearing inspections frequently reveal deep and wide radial grooves cut into the bearings by the passage of metal particles through the oil lines to the bearing where clearance at that point becomes small enough so that the foreign matter scores the bearing. All of these sources of contamination can be virtually eliminated by keeping the engine lube oil screens in good repair. The committee wishes to point out that this is one of the minor maintenance items, which if ignored, can seriously affect the overall maintenance of the engine, since tears in the filter screen will permit passage and introduction of these particles into the engine lubricating system where they may cause serious damage.

If engine air intake filters and lube oil filter screens receive proper attention, then the diesel engine lubricating oil filters are in the best position to perform their task of removing all other contaminants from the diesel engine lubricating oil.

Diesel engine lubricating oil filters constitute an expensive item in engine maintenance. The cost of labor to change out the filters, and the loss of engine lubricating oil absorbed by the filter must be added to the base cost of the filter in determining its total cost.

If filtering efficiency is equal between two types of filters, the filter having the greatest capacity, and hence, the

longest service life, should prove the most economical to use. Diesel engine lube oil filters in railway use are either of the cotton waste or the paper disc type. The physical and chemical mechanics of filtration with these types of media are not yet clearly understood and the committee cannot, therefore, offer any recommendations regarding a type of filter to be used. It does recommend that whatever filter is used, it should be selected on the basis of filtering efficiency and filter life, if optimum maintenance is to be achieved.

Although the lubricating oil filters can successfully remove solid contaminants from the diesel engine lubricating oil, they are incapable of removing contaminants which form solutions or emulsions.

Water—Dielectric and Ultra-Violet Detection

One of the contaminants is, of course, water, resulting from water to oil seal leakage.

The successful detection of water in the lubricating oil sample is of great importance, since it emulsifies with the oil, and the reduced film strength of the emulsion may permit metal to metal contact, and result in premature failure of moving components in the engine.

Corrosion inhibitors used in the cooling water tend to promote premature oxidation of the diesel engine lubricating oil.

A quick and easily performed shop test is desirable to detect the presence of water in the lubricating oil, and for this purpose, some railroads use a small hot plate. The plate is heated until it reaches a temperature of 400 deg F, which is controlled by the use of a temperature crayon. A few drops of the oil to be tested are placed on a hot plate, and if any water is present, it can easily be detected since it tends to boil or fry out of the oil sample.

Another device consists of a dielectric strength unit where a sample of oil is placed between electrodes, and the presence of the water reduces the dielectric strength of the oil which is indicated by a suitable meter or light.

Dilution of the diesel engine lubricating oil by the diesel fuel must also be controlled.

A variety of oil viscosimeters suitable for determining the reduction in viscosity caused by diesel fuel are not available for determining the presence of dilution.

When it has been established that the oil is being diluted by the fuel, it is then necessary to locate the source of fuel leakage and correct it. One technique is to wipe down the top deck free of oil; apply pressure to the fuel distribution system and closely observe it for leaks. This is a difficult and time-consuming procedure, and recently it has been found that the use of ultraviolet, (more popularly known as black light), has proven advantageous in detecting and eliminating these points of leakage.

Generally, the oil and fuel oil, when observed under black light illumination, present a different fluorescent appearance. The lube oil will appear as a gray white or dirty white, whereas the fuel oil will appear purple in color. These differences are easily discernible and permit rapid observation and location of leaks with a minimum of labor. Portable ultra-violet light equipment is available for this use.

Routine injector tests, of course, must also be performed for the purpose of correcting malfunctioning injectors which may contribute to the dilution problem.

Cooling Water

The water used in the cooling water systems of the engines must be properly treated to prevent a deposition of water soluble salts and corrosion in the cooling system. When raw water supplies have highly dissolved contaminants, it may be necessary to provide softening or demineralizing water treatment facilities for the elimination of these undesirable solids. Regardless of whether this is necessary, the water must then be treated with a suitable corrosion inhibitor to prevent corrosion of the various metals in the cooling water system.

Since proper corrosion inhibition is only obtained when the inhibitor is maintained at a special optimum level, the concentration of the inhibitor in the cooling water should be regularly tested and replenished when tests indicate this is necessary.

To neglect such precautions will lead to corrosion of the cooling water passages in the engine, plugging of the water coolers, inefficient heat transfer, and multiple difficulties in engine maintenance.

Cleaning

In addition to keeping the engine clean on the inside, it is, of course, of cardinal importance to keep it clean on the outside, including the engine compartment, rotating electrical and electrical control equipment. A regular cleaning procedure utilizing proper cleaning materials and methods should be adopted.

Air filters of main generators and electrical cabinet protection are proving most successful in reducing maintenance of these components. The application of these filters has permitted some railroads to extend cleaning intervals from once each month, to once each three months. It was necessary to remove and relocate the air compressor after cooler, in order to provide room for the filter housing. This has produced an additional advantage since the air compressor after cooler is now located on top of the radiator hatch. The air passed through the after cooler is lower in temperature. The new after cooler does not offer as much resistance as the older design and provides a cooler running compressor. In addition the compressor discharge oil separator has been eliminated, removing further restrictions to the flow of air.

Another maintenance saver that is available is a fitting for connecting water or oil lines replacing rubber hoses. This fitting incorporates two "O" rings that are clamped on metal tubing and allows a flexible tight seal. This fitting is not new to the plumbing industry, but is new to the railroad maintenance people.

Automatic blowdown for removing water from the main reservoirs has proven to be a most worthwhile addition. The application of this equipment has greatly reduced air brake malfunctioning.

Magnetic Particle Inspection

When it becomes necessary to overhaul engine component parts, this work should be carefully done in accordance with the engine builders' recommendations. The use of fluorescent magnetic particle inspection techniques such as Magnaflux and Magnaglo is strongly recommended by the committee. These techniques will locate cracked and defective components and prevent their reassembly and reapplication to the engine where they may fail

prematurely. Valves and other non-magnetic parts in the engine should be subjected to careful inspection by a dye penetrant inspection method in order that defective parts may be located and eliminated before they are applied to the engine where expensive failures may develop as the result of their application.

The lubrizing of reconditioned pistons is very advantageous. The Parco Lubrite treatment produces a non-metallic oil absorbent coating on the piston surface that aids rapid break-in and reduces subsequent wear of the piston and liner.

Piston and liner scoring on load test following assembly changeout has been virtually eliminated and the premature removal of power assemblies due to scoring before they have run their expected mileage has been greatly reduced where lubrizing has been adopted.

The Test Department

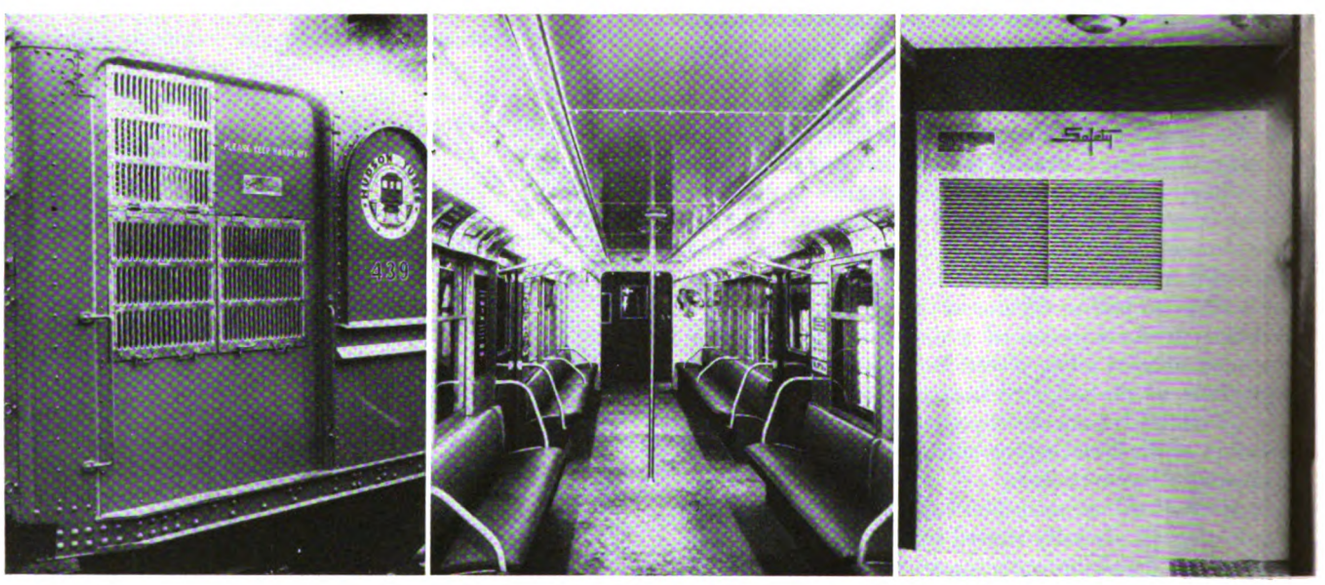
It is unlikely that any diesel maintenance program could become the "Positive Maintenance Program" without the aid of a test department. A test department is an essential part of the program.

Its analysis of a sample of oil taken from the crankcases of engines provides information that can and does save thousands of dollars monthly. This information properly correlated reflects mechanical conditions with such surety that many phases of the engine mechanical program could be controlled by its use.

Loss of crankshafts should be practically eliminated by laboratory control and the present steel back bearings. This ever present hazard is thereby reduced to the very minimum.

The analysis provides us, the mechanical personnel, with information of such nature that we will have positive control of the lube oil, and thereby save many oil changes.

The test department is very instrumental in many phases of the shop work or related work, such as water treatment control, fuel oil specifications, lubricants, cleaning compounds and procedures, paint, etc. It helps develop techniques in the use of dye penetrants, lubrizing, Magnaglo.



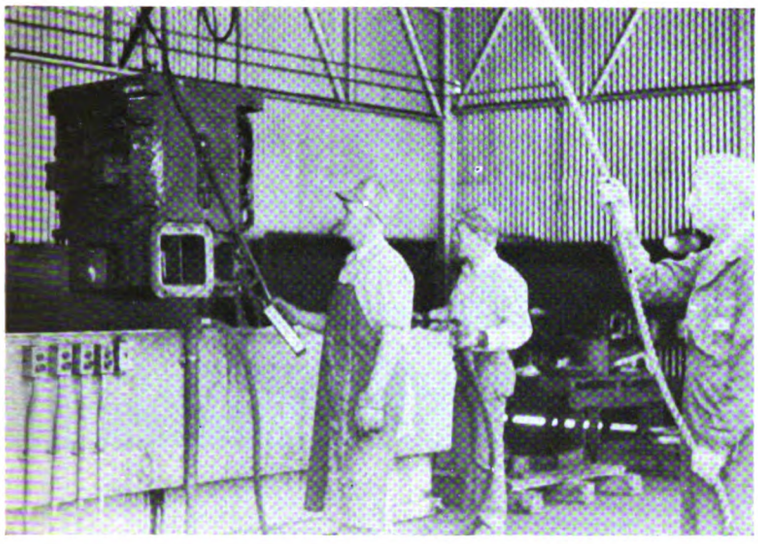
Left: Exterior of air-conditioned Hudson & Manhattan Tube car showing air inlets. Outside air enters through the dynamic grilles, permitting fresh air to circulate for condenser and car cooling. Center: Interior of the car showing twin air distributors in ceiling where fans formerly were installed. Air is circulated uniformly through car by the cooling system. Right: Safety package-type conditioner,—10 to 12 tons capacity. This single unit contains the motor-driven compressor, air-cooled condenser, evaporator, heat coils and controls, and is the first installation of central air conditioning in an underground rapid transit service.

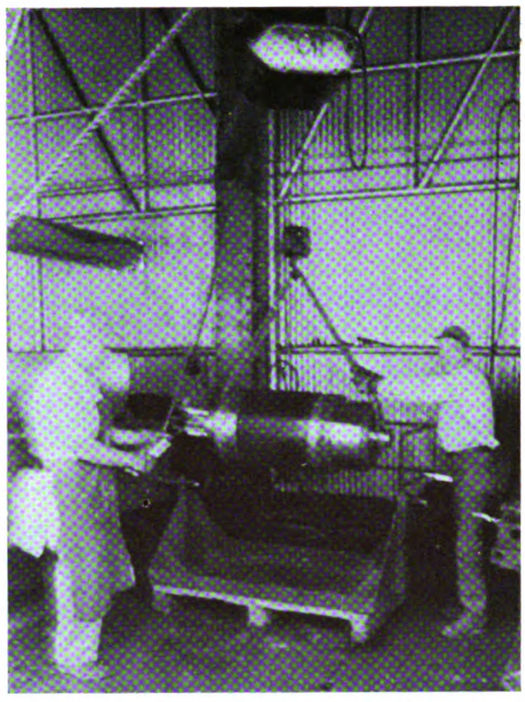
Hudson Tubes Shows First Air-Conditioned Subway Car

The Hudson & Manhattan, Hudson Tubes, staged a demonstration run of an air-conditioned passenger car from Hudson Terminal, New York, to Hoboken, N. J., and return. The air conditioning equipment was supplied by the Safety Car Heating & Lighting Co., and is installed in one of the car vestibules. Located this way, in the passenger space, it necessitates closing one vestibule door. Electrical equipment is placed in an adjacent locker which requires the space of one passenger seat.

The equipment is in package form and has a capacity of 12 tons. The three 600-volt motors driving the compressor, the condenser cooling fan and the air circulating fan have a total capacity of 18 hp. Control equipment operates from the car's 64-volt circuits. A total of 3,000 cfm of air, 25% of which is fresh air, is delivered through a central duct to air diffusers in the car ceiling. The car was 45 ft long. A differential of 10 to 15 deg between ambient and inside air is possible.

A similar car employing four individual air-conditioning units was demonstrated on lines of the New York City Transit Authority, and will be continued in service to determine its performance under full service conditions.



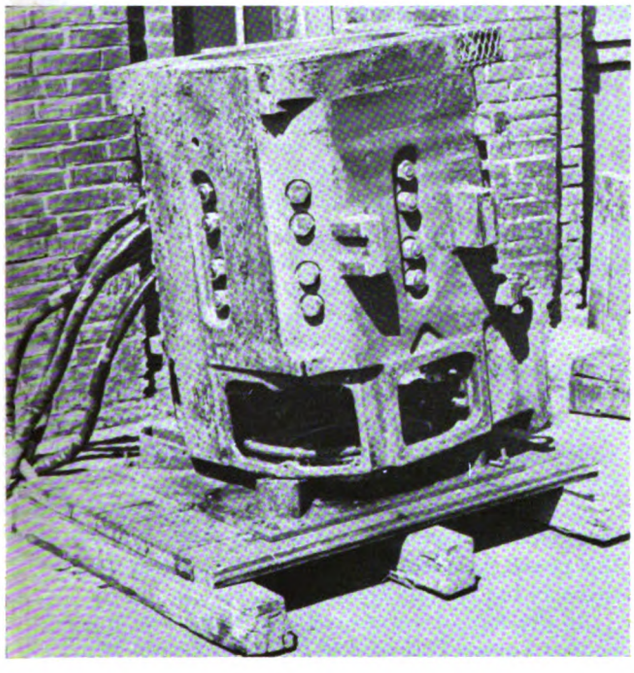


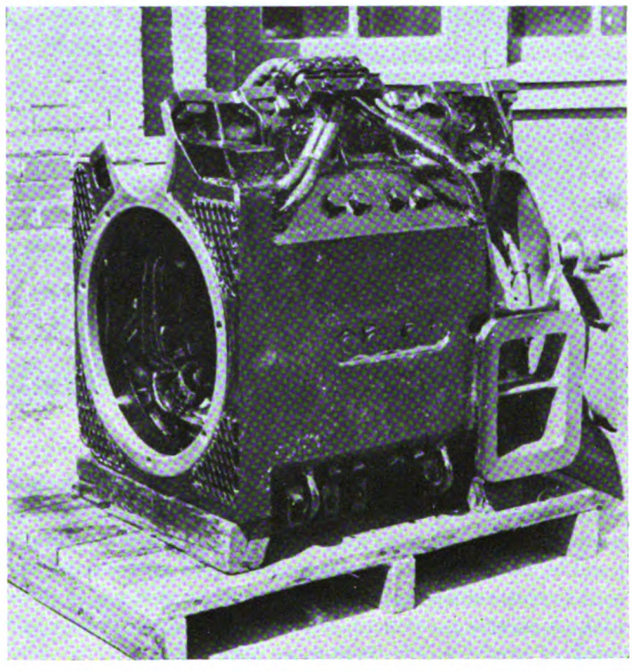
A traction motor frame goes into the degreaser. (above)

A cleaned armature is placed on a rolling stand in which it is supported on lathe centers. (at right)

The complete cleanliness of the cleaning process may be seen from the appearance of the exterior of this frame. (lower left)

A motor frame after black surface varnish has been applied. (lower right)





Self-Timing Degreaser

■ The Southern Pacific has provided an answer to a long-standing argument about vapor degreasers for electrical equipment. Non-users say, "I am not sure that the degreaser solvents do not penetrate the varnish so as to reduce its insulating quality and its mechanical strength." Users reply, "The solvent does take off an outer film or skin of varnish and with the removal of this film goes all the brush carbon and brake-shoe dust which has become embedded in the surface of the varnish. The little varnish that is removed is then replaced in the impregnator." All agree that for electrical insulation, the degreaser should be used discreetly.

A means of insuring the removal of imbedded dirt surely with a minimum of degreaser time has been evolved in the Sacramento, Calif., shops of the Southern Pacific. Basically, it consists of impregnating the field or armature coils with a varnish which is highly resistant to trichlorethylene, and then adding a spray coat of a

varnish which is easily removed in the degreaser. Dirt is thus removed quickly, and the parts only need to remain in the degreaser for a short time.

In the process of cleaning, the complete motor is first hoisted over the degreaser tank and hosed with liquid solvent. After disassembly, the motor frame is held above the vapor line while a flow of solvent is used to clean the exterior and the ventilating screen. It is then lowered into the vapor for 1½ minutes, raised and hosed.

Armatures are treated in a similar manner as frames.

From the Diesel Maintainer's Note Book

The Diesel That Played Crawfish

By Gordon Taylor

A GP-7 was operating as a single unit on a local freight train. Everything seemed to be all right until it became necessary to make a back-up move. This was done without trouble, but when it became necessary to go forward, the unit simply refused to make a forward movement. It could make a reverse movement, but nothing that the crew could think of would enable them to go forward.

The crew called the master mechanic by phone, who very wisely suggested that they examine the *CD* interlock that is part of the *Forward* switch located at the top of the Reverser drum. For some reason, the crew could not locate the suggested cause of trouble.

It was necessary for an electrician to drive about 70 miles to the scene of the trouble where he found that the *CD* interlock of the *Forward* switch was bent in such a manner that it was not making a connection with the rotating contact located on top of the reverser drum. It required but a few minutes to clean the *CD* contact fingers and bend them into position where they could set up the controls necessary for forward operation.

The situation raised the question "What is necessary to cause a locomotive to operate in reverse direction?"

It is necessary to move the reverser handle in the desired direction. This closes a contact in the reverser control drum, located at the control stand.

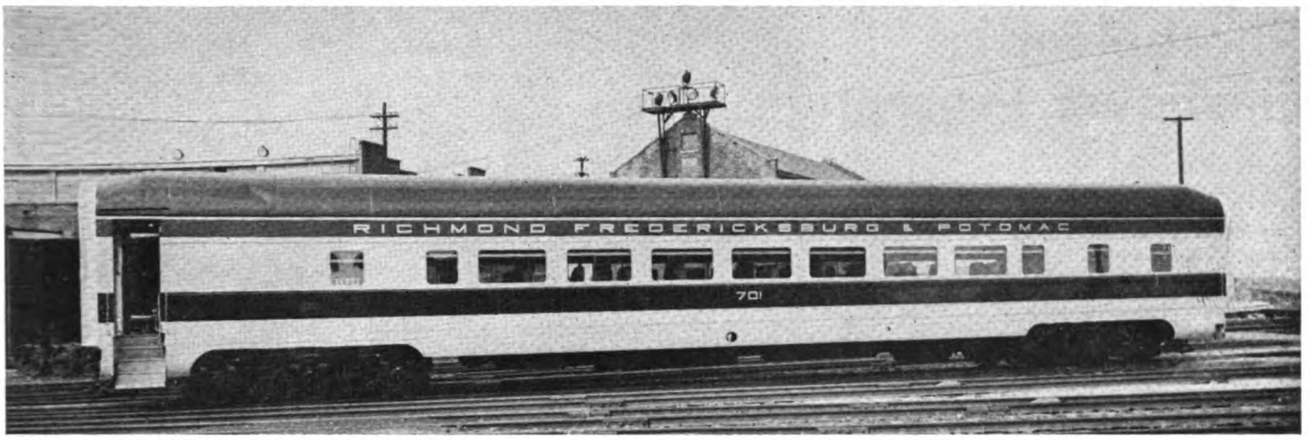
The contact set up by movement of the reverser handle energizes the magnet valve on the main reverser drum that causes the air-operated cylinders to throw the reverser drum in the desired direction.

At the top of reverser drum, there are two sets of contact fingers. One pair of fingers is known as interlock *CD*, which is necessary for forward movement. The other contact fingers on top of the reverser are known as interlock *EF*, which is necessary for reverse movement. These directional interlocks close the circuit through the isolation switch to energize the series and parallel power contactors.

In this case, the unit had been operating satisfactorily in the forward direction just before being operated in the reverse direction. The trouble almost had to be either a broken wire or a defective contact on the interlocks on top of the reverser drum.

In such a case, it would be proper to open the isolation switch, then examine the directional interlocks to see if they are dirty or bent in position where they cannot be contacted by the rotating contact on top of the main reverser drum.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.



Exteriors, as well as interiors, have been restyled.

RF&P Modernizes Coaches

■ As part of its current passenger-equipment modernization program, the Richmond, Fredericksburg and Potomac is rebuilding six of its earlier air-conditioned coaches, upgrading them to parity with the latest type of streamlined cars. The work, which includes installation of a new 110-volt electrical system, increased air-conditioning capacity, fluorescent lighting, and other new features, is being done in its own shops in Richmond, Va.

The cars will have incorporated all the features of today's newest air-conditioned cars.

The interior of each coach is being completely rebuilt and the exterior streamlined. Narrow single-glazed wood sash are being replaced with wide double-glazed metal sash, supplemented by cable curtains. For utmost seating comfort, bucket-type seats are being replaced by de luxe rotating-reclining seats with adjustable headrest and footrest.

Other features include vestibule folding steps, vestibule trap doors, tight-lock couplers, rubber draft gear, rubber side bearings and electro-pneumatic end doors that open at the touch of the finger and then close automatically.

The former incandescent-light fixtures and narrow luggage racks are being replaced with fluorescent lights and solid luggage racks 20 inches wide, under which are located 26, 30-watt fluorescent cove lights, which extend along both sides of the entire length of the main body of the car. For additional illumination, 26 individually controlled 15-watt fluorescent seat lights are also located beneath the baggage racks. Other fluorescent lighting includes five 30-watt center lights, five 30-watt rest-room lights and five 15-watt hallway lights.

The refrigerating capacity of the air-conditioning system is being increased from six to eight tons. Other new electrical equipment includes a radio and public-address system.

The new electrical system employs as a primary source of power a 25-30-kw axle-driven generator with an output of 26 kw at 780 rpm and 35 kw at 2,470 rpm. The power during non-generating intervals is furnished by an 88-cell A12H Edison Nickel-Iron Alkaline storage battery, having an 8-hour capacity of 55.47 kw-hr. A-c power for the

Fluorescent lighting is used throughout, with individually-controlled seat-lights.

fluorescent lamps, radio and public-address system is furnished by a motor-alternator having a capacity of 2½ kw.

Incandescent lamps, exhaust fans and a water cooler represent a total maximum load of 560 watts, and together with a 1-hp air-conditioning-blower motor are supplied from the d-c side of the system through load voltage regulation. Also operating on the d-c side of the system, but as unregulated loads are a 12-7 ½-hp refrigerating-compressor motor and a 1-hp condenser-fan motor.

The battery is housed in two boxes of 40 and 48 cells, respectively, suspended from opposite sides of the car. Short jumpers are employed for tray-to-tray connections which effect a reduction of 1½ to 2 volts in voltage drop as indicated by test-readings at the electrical locker.

A new safety feature incorporated in these cars protects the electrician when he is connecting the motor-generator to a-c yard power. The motor-generator starting button is located five feet away from the a-c receptacle so that, after plugging in the leads, the electrician must be at least that distance away from the receptacle before he can start the motor-generator.

Photoelectric Flashover Protection

TO THE EDITOR:

John W. Brown, in your September issue, suggests the possibility of using a photocell to augment the impulse relay providing additional protection to the commutator, brushes and brush holders of the diesel-electric locomotive main generator. The idea of using a photocell to detect excessive arcing, ring fire and flashover is very appealing, but it is subject to certain practical considerations which would appear to make it doubtful that a successful application could be made. A photocell arranged to scan the commutator between brush holders would be in a good position to detect flashovers of the type that are now detected by the impulse relay or the ground relay, but this would not provide additional protection. It would also be in a position to pick up light from ring fire but this light is of such low intensity that a device sensitive enough to detect it could be expected to be subject to false operation as a result of stray light.

Positioning of the photocell to scan the commutator at some other point would be subject to similar difficulties. Providing for protection against damaging arcing or flashover which would not be detected by the impulse relay or the ground relay would require in the photocell an ability to discriminate which it might well be impossible to build into it.

While it cannot be said that the idea is without merit, the conditions presented above have thus far discouraged any consideration on our part of attempting to develop a practical photocell device of the type suggested by Mr. Brown.

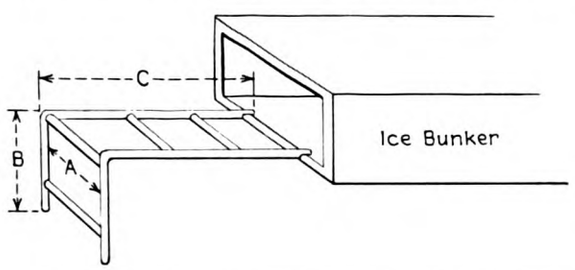
W. A. KIRSCH
Westinghouse Electric Corp.

Icing Rack

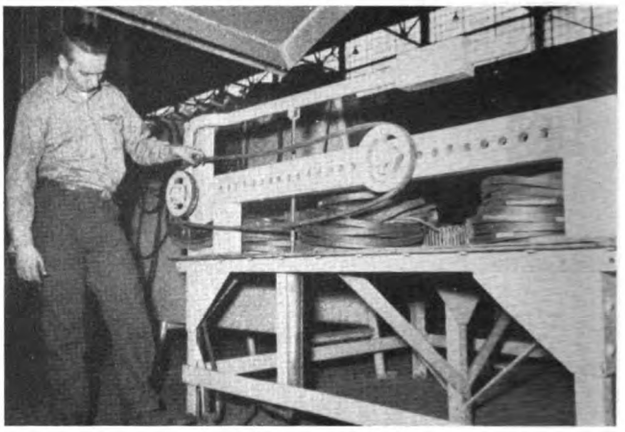
By David H. Noble

■ Icing air-conditioned cars with standard three or four hundred pound blocks is an easy task with the rack shown in the sketches. Simple to build from scrap pipe, and light enough to move from car to car, it eliminates strained muscles, broken toes, and train delays that come when car forces attempt to manhandle ice without proper tools.

And, in addition to speeding the icing operation, it will improve air conditioning performance. A 300-lb block melts more slowly than six, 50-lb cakes, and the possibility of a car running out of ice is greatly reduced.



Made of sections of pipe welded together; the dimension *A* is controlled by the size of the ice cakes used, *B* is controlled by platform height, and *C* is made to suit space requirements. The ends of pipe sections resting on the bunker are flattened.



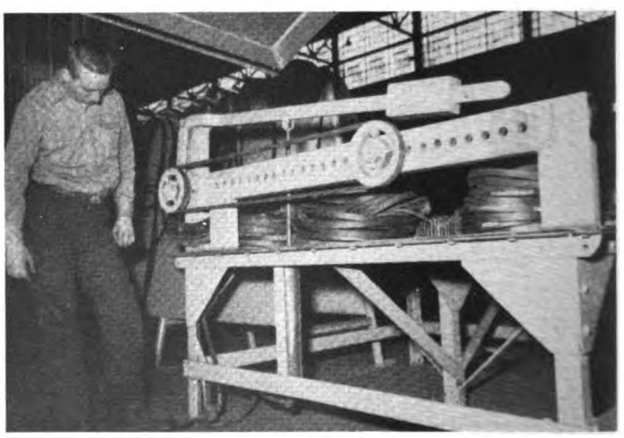
Pressure on a foot treadle lifts the weight for applying or removing belt.

Belt Matcher

■ To assure satisfactory operation and long belt life, Vee belts which are to be used on multiple-belt pulleys must all be the same length. The device shown in the illustrations makes the selection easy. Stepping on a treadle raises the horizontal arm of the L-shaped lever which has a weight on the long end, and a Vee pulley on the short end of the L. The lever is pivoted just above the operator's hand. Just below the left-hand pulley, is a pointer which is an extension of the short end of the L, and which moves back and forth over a scaled quadrant as the weight is raised or lowered.

With the weight in the raised position, a belt is placed over the two Vee pulleys and when the operator removes his foot from the treadle, the weight applies tension to the belt. Belts under the same tension having the same length, as indicated on the quadrant, are selected for multiple operation.

The holes in the horizontal member provide for belts of various length and the weight may be slid along the upper bar to adjust belt tension.



With tension on a belt, its length is indicated on a quadrant below the left-hand pulley.

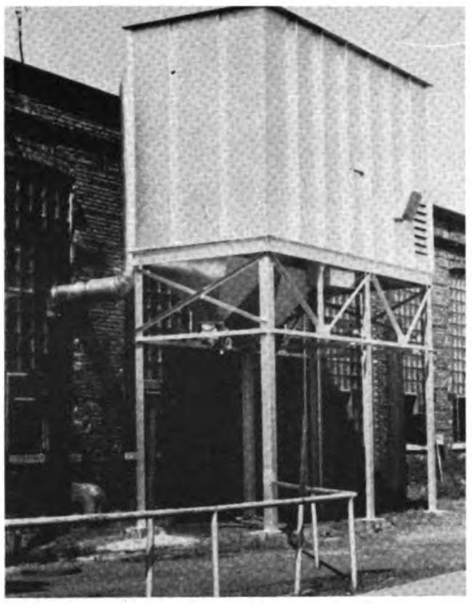
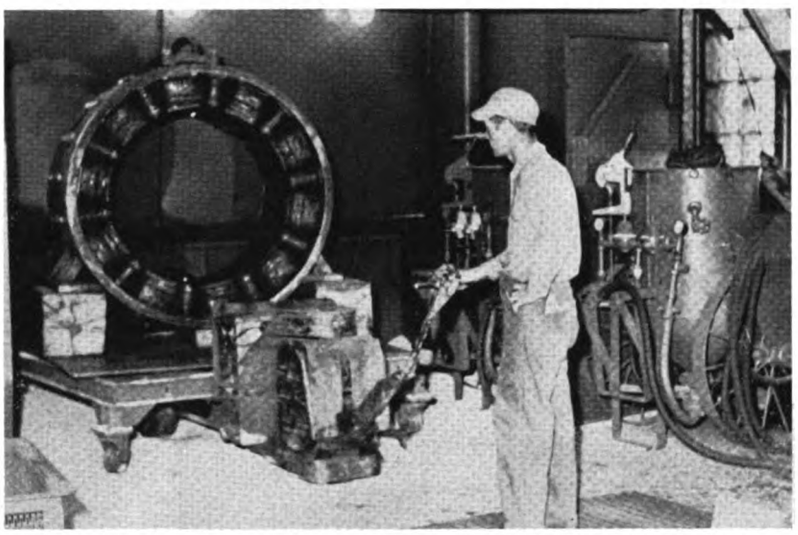


Fig. 1 (Upper left)—Wood pellets are used to clean metal parts of frames and armatures.
Fig. 2 (Upper right)—Used cleaning materials are collected in the separator which may be unloaded through bottom hoppers.
Fig. 3 (at left)—The insulation on a generator frame being cleaned with ground corn cobs.
Fig. 4 (below)—When the work is finished, a Transporter moves it out of the booth on the skid-positioner.



Corn Cob and Wood Pellet Cleaning

■ The Rock Island has installed means of blast cleaning insulation and metal parts of traction motors and generators in its electrical shops at Silvis, Ill. The equipment includes a Pangborn booth, (Fig. 1), complete with the necessary pressure tanks, hoses, nozzles, etc., and a separator, located outside the shop.

Ground corn cobs are used for cleaning insulation surfaces, and wood pellets are used for the metal parts of frames and armatures. The cleaning materials are not reclaimed, but are collected in the outside separator, from which they are later removed through bottom hoppers.

Parts being cleaned are placed on a castored skid, on top of which is a turntable or positioner. The turntable enables the operator to turn his work to any desired position as shown in Figs. 1 and 3.

When the work is finished, or when new work is to be moved into the booth, it is done with a battery-powered Transporter, as shown in Fig. 4. It is run der the skid, and its platform raised just enough to take the weight of the skid and the motor or generator part. The castors on the skid then act as balancers while the machine is moved out to where it can be handled by a crane.

Move your freight cars with trouble-free

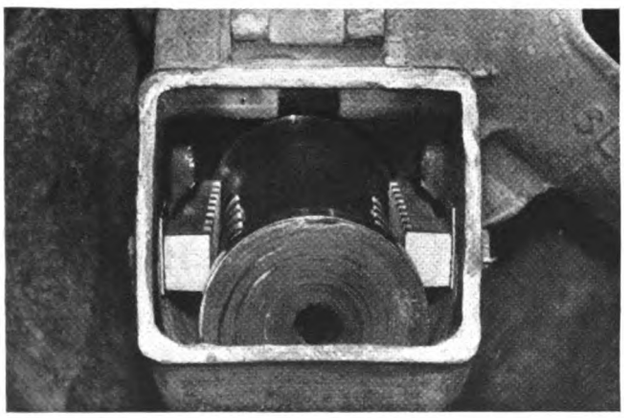
How R-S Journal Stops and Satco lining metal can reduce journal box servicing and maintenance requirements . . . can speed up train departures and eliminate need for servicing en route.

SATCO and R-S Journal Stops make the conventional waste pack an efficient lubricator. They give better bearing performance at the same time they reduce existing maintenance and servicing requirements. They eliminate old problems and *do not add any new ones.*

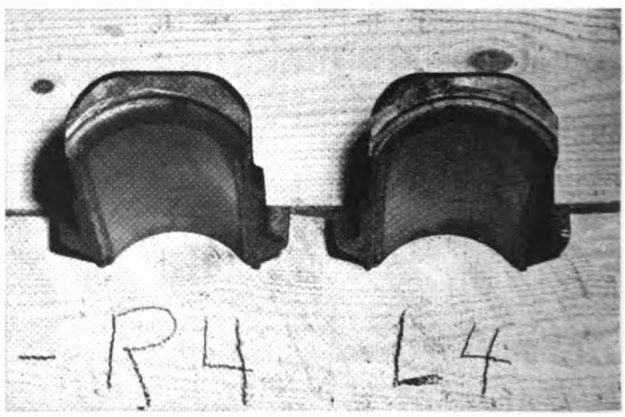
Equip all cars in a consist with Satco and Journal Stops and journal box inspection could be on a periodic basis — would not be required after each humping or switching operation.

The reasons: First, you seldom have to adjust packing and actual adjustment takes less time; second, you keep more oil in the packing, get constant lubrication; and third, bearings run cooler increasing vital oil film thickness.

R-S Journal Stops keep the packing right where it belongs — 1" below the journal center line. Time and again road service tests with Journal Stops have proved that packing is undisturbed even after trips of 5000 miles or more. Without R-S Journal Stops, whenever there's a road or switching impact, or heavy brake application, you force the axle out from under the bearing. That crushes the dust guard, forces the box to rise, and squeezes the packing against the bottom of the journal — squeezes the



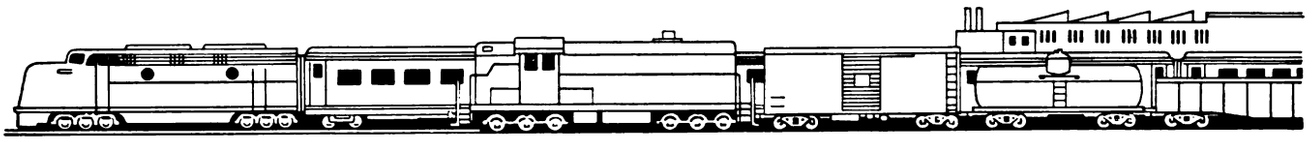
View of R-S Journal Stop installation with box jacked and bearing, wedge and packing removed. Note shims which permit maintaining nominal clearance on undersize journals.



Two of bearings removed after 38 months service in freight car equipped with R-S Journal Stops. All bearings were in such excellent condition they were reapplied. Crown has extended to point where it is wider than required for "fitted" bearings — but lining has not overrun.

MAGNUS METAL CORPORATION

?????



TWO NEW PROBLEMS have come to us this month. If your experience or ideas can help with these topics, remember it pays to submit them to Q&A Editor, Locomotive & Cars.

- *Can diesel locomotive interiors be water-proofed so they can be spray cleaned without damaging the electrical equipment?*
- *For ordinary car repair operations, are there ways to speed and mechanize the application of wooden box car lining?*

JOURNAL LUBRICATORS

Have any special tools been developed for installing the newly-developed journal lubricating devices, can the regular packing hook be of any use, or is this strictly a hand operation?

INSPECT THEM—THEN, HANDS OFF, *by W. L. Magee, Jr., coach foreman, Houston Belt & Terminal, Houston, Tex.* The best tool an oiler can have when inspecting the new lubricating devices is a good hand lantern. He should confine his inspection to looking inside the journal box for defective rollers, springs, pads and retainers. Any attempt to use the regular packing hook will probably result in damaging springs or arms on the rollers, or in tearing the special packing or pads. Any rearrangement of the parts on these lubricators should be done by hand. This should be done only when necessary. At other times a strict "Hands Off" policy should be followed.

The car oiler should keep in mind that these devices work best when the proper oil level is maintained. He should inform himself of the correct oil level for all these various lubricating devices, and should then fill each box to the proper level with good clean AAR car oil.

●

LOCOMOTIVE REWIRING

During the rebuilding of older diesel units, is the most economical solution complete rewiring? When it is used, is this the thing that keeps the unit in the shop the longest, and if it is, how can this time be reduced?

REWIRING CAN BE SCHEDULED, *by W. H. Mims, superintendent motive power and equipment, Central of Georgia, Savannah, Ga.* Nearly every railroad supervisor is convinced that complete rewiring is desirable on older units. Exactly how and when it is to be done is a problem that must be worked out individually by each road to satisfy its own particular demands.

On a road such as ours, with a motive power fleet that includes small groups of different models from all four builders, we cannot take advantage of production line programming of rewiring. Further, we do not normally unit exchange engines, generators and trucks at heavy repairs because of the large investment in extra equipment this would require. As a result, units placed in the shop for heavy repairs are held while the engine and other major components are rebuilt.

Under these conditions, we do not find that rewiring delays outshopping. Most of the wiring can be completed during the time the engine is being rebuilt, although in every case of locomotive repair, some work cannot be completed until the other crafts have finished their portion of the work. Since this is true whether the locomotive is rewired or is simply stripped for repairs, it cannot be blamed on the rewiring.

Engine rebuilds do not always correspond to rewiring requirements so we frequently take advantage of short out-of-service periods to perform partial or "progressive" rewiring. Since locomotives are invariably available during monthly and annual inspections, wheel changes and other running repair work, we take advantage of this out-of-service time to renew as many circuits as possible. In this manner, unit can be slowly and systematically rewired with no loss of availability.

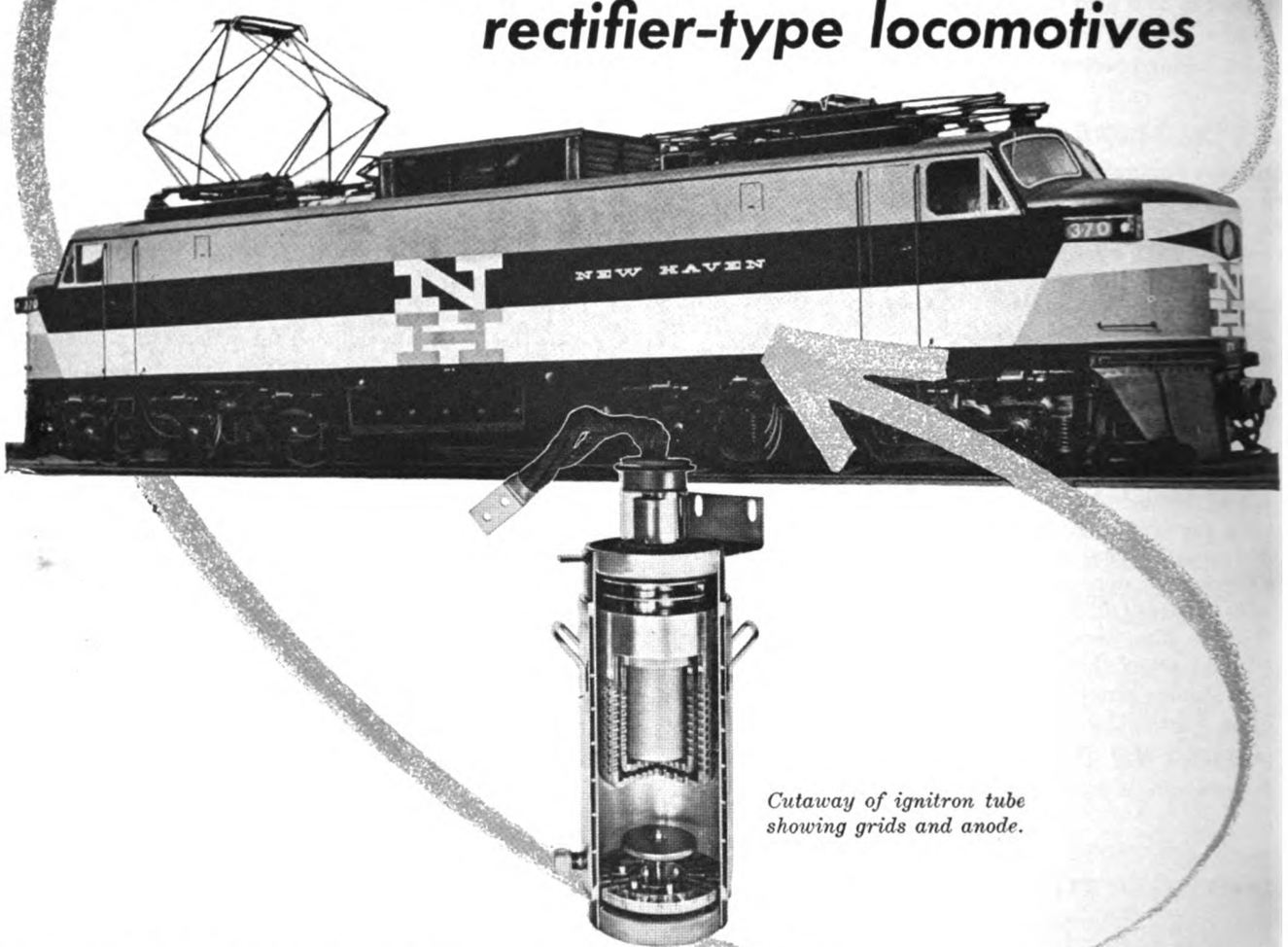
Successful rewiring demands specialists. Whenever possible, it pays to train a rewiring crew, and to use this force consistently on rewiring. Unless this is done, labor costs will be excessive and locomotive delays because of incorrect connections will be frequent.

FIRST, HOW IS THE WIRING? *by L. E. Legg, electrical engineer—equipment, Chicago & North Western.* We have found that the general condition of the wire insulation can be determined by history, observation and by megger readings. When we are anticipating the shopping of a certain locomotive, we go through the history of the unit's operation to determine whether or not wire insulation has caused any trouble or road failures. If there have been none, it is assumed that the wiring is not in an extremely poor condition.

After the locomotive is tied up for heavy work, a very careful examination is made. The condition of the eyelets and lugs is checked, and the flexibility of the insulation is determined. Even though the insulation may be found to be hard and set, it may not be replaced except at locations where it must flex during operation. Finally, a megger test is made. If there is a reading of over one megohm, the wiring is not replaced. The C&NW has several locomotives which have their original wiring after

(Continued on page 88)

Speer carboneered IGNITRONS power New Haven's ten new rectifier-type locomotives



Cutaway of ignitron tube showing grids and anode.

Twelve G-E double-grid ignitron rectifier tubes supply d-c power to the New Haven Railroad's new 4000-horsepower locomotives. Each tube contains a Speer graphite shield grid, control grid, and anode. These parts are made of the finest grade graphite—free of impurities that cause arc-back and flash-over.

Precision-machined shield and control grids are designed to operate at voltages up to 500 volts—the anodes at voltages up to 4000 volts. Speer graphite electrodes withstand high overloads without melting. In addition, their coefficient of expansion is so small that there is no warp or distortion.

Applications of carbon products throughout industry are virtually limitless. Speer *Carboneering* has contributed vastly in fulfilling unusual design and material requirements. Let our experienced designers and engineers help you *Carboneer* a practical solution to your parts problem.

You be the judge of carbon's versatility

Carbon can be:	Carbon has:
Sawed	High corrosion resistance
Drilled	High heat transfer
Milled	Low electrical resistance
Broached	High thermal shock resistance
Turned	
Planed	**Carbon is:**
Hobbed	Not wetted by molten metals
Ground	Non-warping
Molded	Chemically inert
Extruded	Self-lubricating

SPEER Carbon Co.
St. Marys, Pennsylvania

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

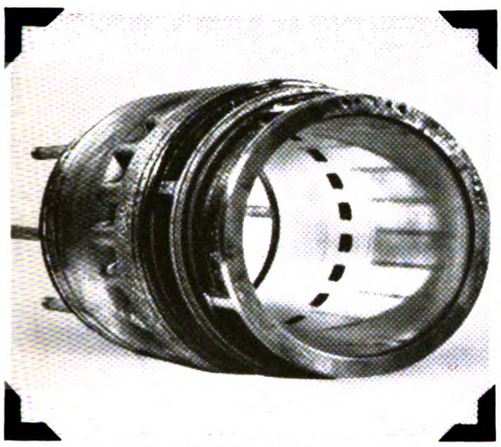
UNIT Diesel locomotive

SERVICE Mountain freight haul

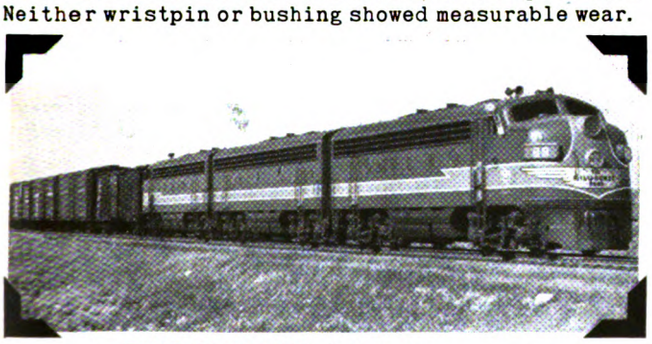
CONDITIONS Long, continuous grades to 1.6%

FIRM The Milwaukee Road

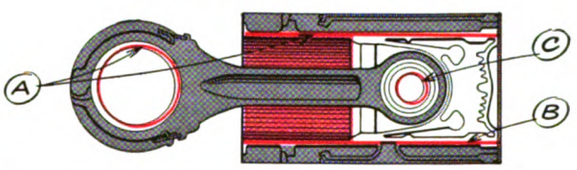
333,590 freight miles—only 0.0035 inch liner wear!



LUBRICATED WITH RPM DELO OIL R.R., this representative cylinder assembly was in good condition when pulled for regular inspection after 333,590 actual freight miles. Operation was on The Milwaukee Road's tough run between Othello, Washington, and Avery, Idaho. This liner, shown as it came from the engine, miked only 0.0035 inch wear, 0.001 inch taper, despite hard operating conditions—heavy loads, wide temperature variations, heavy grades, including one stretch of 20 miles of continuous 1.6 percent. Neither wristpin or bushing showed measurable wear.



How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

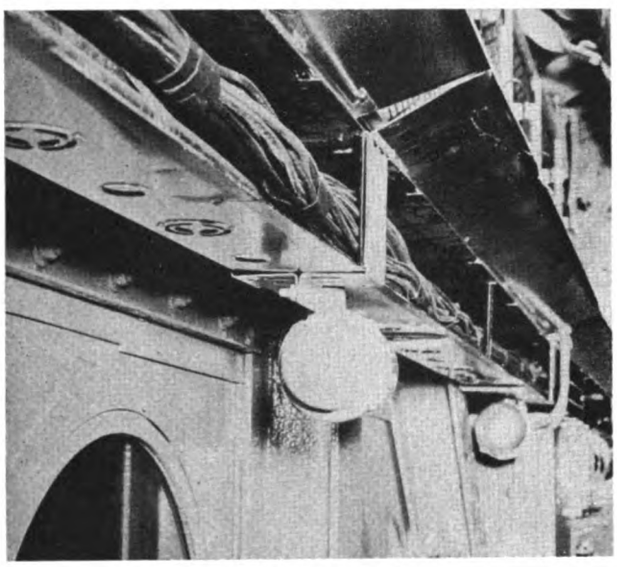
(*Continued from page 85*)

16 years of service. Often only portions of the wiring system are replaced. Up to the present time, only about ten units have been completely rewired.

After many years of experience in diesel-electric wiring, we feel that the type of insulation which is applied by the "strip process" gives us the best service. This type of wiring has a high dielectric next to the conductor. Defective conductors never are the cause of wiring replacements. It has always been weakened insulation, and because of the high labor cost in rewiring, the best insulation available is the most economical.

At the present time we do not feel that complete rewiring is the most economical solution. Only in extreme cases, such as when fire damage is involved, is it necessary to completely rewire a locomotive. In the future we must expect to completely rewire locomotives on a periodic basis because we know that insulation will not last forever.

One factor which has greatly increased the cost of rewiring on some locomotives has been the small con-



Wire ducts have replaced conduits on some locomotives.

duits originally installed. It may not even be possible to pull out the old wire, and new conduit must be installed. Recent thinking has led to the use of wire ducts to minimize shopping time. If they are used, they must be laid out so that there are no low points or pockets to collect moisture.

WITH CARBODY REBUILDS—NOT ENGINE REPAIRS, *by C. W. Martin, assistant engineer—diesel electric, Baltimore & Ohio, Baltimore.* The term "rebuilding" should be qualified to indicate that the complete unit is being upgraded and not just the power plant. Too many maintenance personnel call heavy repair to the diesel engine "rebuilding". This term is used very loosely.

Complete rewiring of a diesel unit should be done whenever the wiring has deteriorated because of accident or age. Whenever some of the wires in cabinets, conduit or wire ducts must be renewed, an overall job must be considered. It has been our feeling that all the wires of the same age and with the same insulation covering should be replaced at the same time. Then after such repair, the wiring of the unit should be serviceable until the unit receives its next heavy carbody repair.

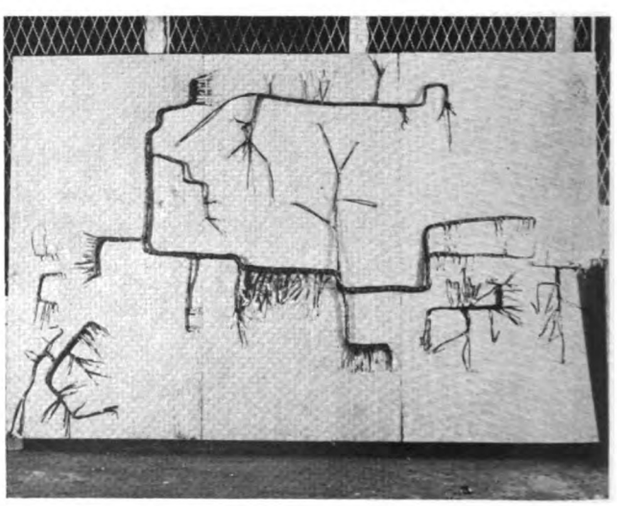
With the old varnish cambric insulation, some of us replaced control wiring without replacing the power wiring. We shortly learned that the power wiring would not give any longer service than the control wiring, and the unit had to be reshopped for this work. Had it all been changed at the same time, considerable expense would have been avoided.

It is our feeling that all wiring should have the same expected service at any time. Rewiring should be scheduled with heavy carbody repairs. There should be a minimum of wiring changes or renewals during the periods between complete rewiring jobs.

NOT DURING CLASS REPAIRS! *by E. H. Schoedinger, Master Mechanic, Florida East Coast, Miami, Fla.* I am sure that those railroads that have gone through the first cycle of a rewiring program will all agree that the second rewiring cycle is much easier. There are several reasons for this. Preliminaries such as the type and quantity of material to be ordered have been established. The experience of the men gained during the first job is now available. Improved materials frequently become available to speed the operations. As an example, the insulated wire we now use has twice the life of that formerly employed.

When the first rewiring job was scheduled on our railroad, from 200 to 210 working hours were required to do the job. Now with the modern tools for crimping lugs, and using previously prepared harnesses for the high and low voltage cabinet wiring, this time has been greatly reduced. Another aid has been the use of low voltage panels adjusted with instruments on the bench and ready for service when applied.

In my opinion, the scheduling of rewiring can be done at any time, and it is preferable to do the work when the unit is not undergoing class repairs that call for diesel engine work. When there is no engine work going on, the interference and confusion among men of the different crafts is eliminated. To do only a rewiring job allows the mechanics to perform their work in minimum time and shortens the time that the unit is out of service.



Harness permits advance assembly of locomotive wiring.

Announcing . .

New **ARMORTEX**

AMAZING SPRAY-ON, BRUSH-ON PLASTIC COATING THAT *PERMANENTLY* UPGRADES ANY BOX CAR INTERIOR TO MEET HIGH TARIFF LADING REQUIREMENTS!!

Here's really big news the whole railroad industry has been waiting for! Now, for the first time, it is possible to apply a quick, economical protective coating to box car floors and walls which insures the *permanent*, superior surface needed for shipment of high grade bulk commodities such as grits, flour, sugar and grain.

Armortex, an amazing new discovery of the J. W. Mortell Railroad Division, completely eliminates the costly preparation of cars for individual loadings. Internal car surfaces coated with Armortex no longer splinter or deteriorate under normal operating conditions...thus resulting in a reduction of claims due to leakage, infestations, package damage.

Still another big advantage of new Armortex is its ease of application. One man can cover a box car floor in less than 30 minutes...readying the car for service the next day. By spraying, brushing or troweling, Armortex can be applied at any shop, rip-track or siding without returning the car to a central maintenance location.

GIVE LASTING 6-WAY PROTECTION TO BOX CAR INTERIORS, OLD OR NEW!

- **SMOOTH, TOUGH SURFACE—EASILY SWEPT OUT**
- **ADHERENT**—a mastic which bonds to surface. Not a strippable material.
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- **SOLVENT RESISTANT**—unaffected by mineral spirits, water or gasoline. Wood color of film will not stain or discolor.
- **NON-HAZARDOUS**—an oil-in-water emulsion. Presents no fire hazard in storage or application.
- **INSECT RESISTANT**—made of synthetic resin and mineral fillers—absolutely impervious to insects.

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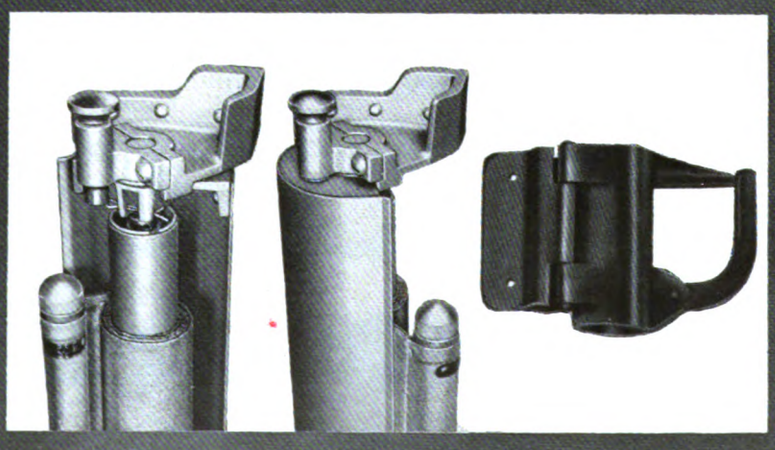

Revolving shield and casing (shield open)

Revolving shield and casing (shield closed)

The new "B-J" vestibule curtain release handle. Positive releasing feature . . . service-proven.

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MANUFACTURING COMPANY

5125 West Lake Street, Chicago 44, Illinois

SUPPLY TRADE NOTES

(*Continued from page 23*)

izing them; and lease of the rebuilt units to carriers on a per diem basis.

Ben Colman, a vice-president of Evans, has been elected president of the new company, and will direct its operation from his Plymouth, Mich., office. General office of Greenville-Evans will be in Pittsburgh.

■

Emil P. Kondra

NATIONAL BRAKE COMPANY.—*E. P. Kondra*, assistant vice-president at New York, has been appointed vice-president, sales.

■

KOPPERS COMPANY.—*R. H. Devine*, assistant sales manager, Wood Preserving division, Pittsburgh, has been appointed assistant manager, eastern district, at Wilmington, Del., and has been succeeded by *J. W. Sullivan*, manager of the Colorado district.

■

SMOOTH-ON MANUFACTURING COMPANY.—*George T. Morse*, formerly with U. S. Gypsum Company, has been appointed vice-president and director of sales for Smooth-on, Jersey City, N. J. Mr. Morse will be concerned primarily with sales development of Smooth-on's new epoxy resin casting and repair compounds.

■

SCULLIN STEEL COMPANY.—*Paul F. Gutmann, Jr.*, assistant chief mechanical engineer, has been appointed chief mechanical engineer.

■

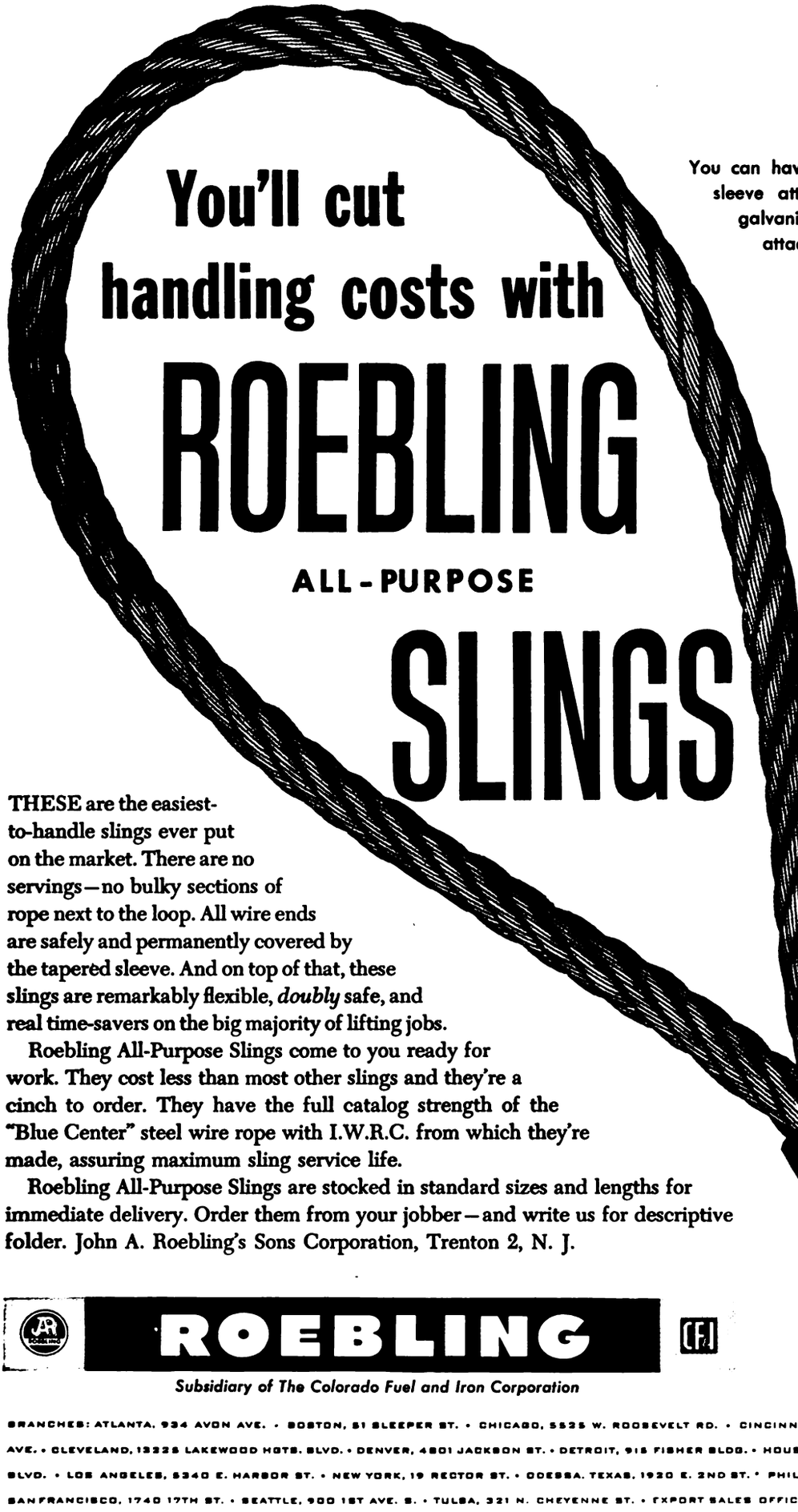
T-Z RAILWAY EQUIPMENT COMPANY.—*Roland E. Olson* has been named representative at Minneapolis.

■

STRAN-STEEL CORPORATION. — The Steel Floor and Stran-Steel Divisions of the Great Lakes Steel Corporation, a subsidiary of the National Steel Corporation, have been established as a separate division of National, to be known as the Stran-Steel Corporation, *Charles LeB. Homer* is president of Stran-Steel. *William A. Baldwin*, formerly Chicago sales representative for the Steel Floor Division, is in charge of national sales. *H. B. Hoesly*, formerly me-

(*Continued on page 98*)

You'll cut handling costs with ROEBLING ALL-PURPOSE SLINGS



You can have these slings with a tapered sleeve attachment with a heavy steel galvanized thimble plus the following attached fittings:

Drop Forged Steel Weldless Hook

Drop Forged Weldless Shackle

Weldless Link

THESE are the easiest-to-handle slings ever put on the market. There are no servings—no bulky sections of rope next to the loop. All wire ends are safely and permanently covered by the tapered sleeve. And on top of that, these slings are remarkably flexible, *doubly* safe, and real time-savers on the big majority of lifting jobs.

Roebling All-Purpose Slings come to you ready for work. They cost less than most other slings and they're a cinch to order. They have the full catalog strength of the "Blue Center" steel wire rope with I.W.R.C. from which they're made, assuring maximum sling service life.

Roebling All-Purpose Slings are stocked in standard sizes and lengths for immediate delivery. Order them from your jobber—and write us for descriptive folder. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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Questions and Answers

General Motors

Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G335-Q—What happens when the ground relay is tripped?
A—When tripped, the ground relay opens the shunt and battery field contactors, unloading the main generator.

G336-Q—What must be done before the unit can again deliver power?
A—The ground relay must be reset by pressing in on the reset button on the relay.

G337-Q—What should be done in case the ground relay trips repeatedly?
A—In this event the power plant must be isolated.

G338-Q—What precaution must be taken before resetting the relay?
A—Always isolate the unit before resetting the ground relay.

G339-Q—What is the visual indication of ground relay tripping?
A—The white needle in the relay will point to a red dot.

G340-Q—What is the normal indication?
A—In normal position the needle points to a yellow dot.

G-341-Q—What is the engine speed after the ground relay trips?
A—The speed of the engine will be reduced to Idle and will remain at that speed unless the throttle is placed in the 5th or 6th notch, in which case the engine will stop.

G342-Q—What other reason besides a high voltage ground may be assigned for tripping of the ground relay?
A—Although a high voltage ground will normally be the only reason for ground relay tripping, a low-voltage ground can trip the relay when the engine is started; at that time the high and low voltage systems are temporarily connected.

G343-Q—Is ground relay action an idication of serious trouble?
A—Not necessarily, but it should be reported.

G344-Q—When the ground relay knife switch is opened, what is the result?
A—When open, this switch eliminates the protection of the ground relay.

G345-Q—What precaution should be taken in connection with this switch?
A—This switch must not be opened in normal operation unless definite instructions are issued by an official of the railroad.

No A-C Voltage Relay (NVR)

G346-Q—How may failure of the alternator result in damage to the traction motors?
A—As the traction motors are cooled by A-C driven blowers, a failure of the alternator could result in damage to the traction motors unless the application of power was stopped.

G347-Q—How does the NVR react to an alternator failure?
A—In case of an alternator failure, the No A-C Voltage Relay, located on the low voltage panel, drops out and causes the alarm bell to ring in all units.

G348-Q—What else takes place?
A—It also turns on a blue light and reduces the engine speed to idle in the unit affected. If the throttle was in the 5th or 6th notch, the engine would stop.

G349-Q—Is an alternator failure usually the cause of an engine stopping?
A—An alternator failure is usually only the result of an engine being stopped and not the cause.

(Manual 2310, page 317)

G350-Q—When will the alternator failure alarm not operate?
A—When isolation switch is in START position.

Dynamic Braking

G351-Q—What changes are made when the locomotive is changed from power operation to dynamic brake?
A—Three changes: (1) The armatures of traction motors are connected to grids located on the top of the carbody; (2) In each unit all four traction motor fields are connected in series with the main generator: (3) The field loop circuit is established.

G352-Q—What is the field loop circuit?
A—This is a circuit connecting the battery fields of each unit in series with the low voltage source in the lead unit.

G353-Q—Describe the action up to and including the connection of traction motor armatures to the grids.
A—By moving the transition lever from the No. 1 to the "OFF" position, a contact in the controller energized the "B" wire throughout the locomotive. In each unit taps from this wire energize the cam switch TOW magnet valve; this moves each cam switch to the TOW position, disconnecting the traction motor armatures from their fields and connecting them to their respective grids.

G354-Q—What other action is brought about as a result of the movement of the cam switch to TOW position?
A—Cam-switch interlock EF is closed which causes the braking contactors (B) to close in each unit, connecting the traction motor fields in series with the main generator.

G355-Q—What other action took place as the transition lever was moved to OFF position?
A—It also energized the field loop contactor (FL) in the lead unit. This contactor connects the brake control (transition lever) to the field loop circuit and partially completes the field loop.

(Turn to page 96)

3 years to go...

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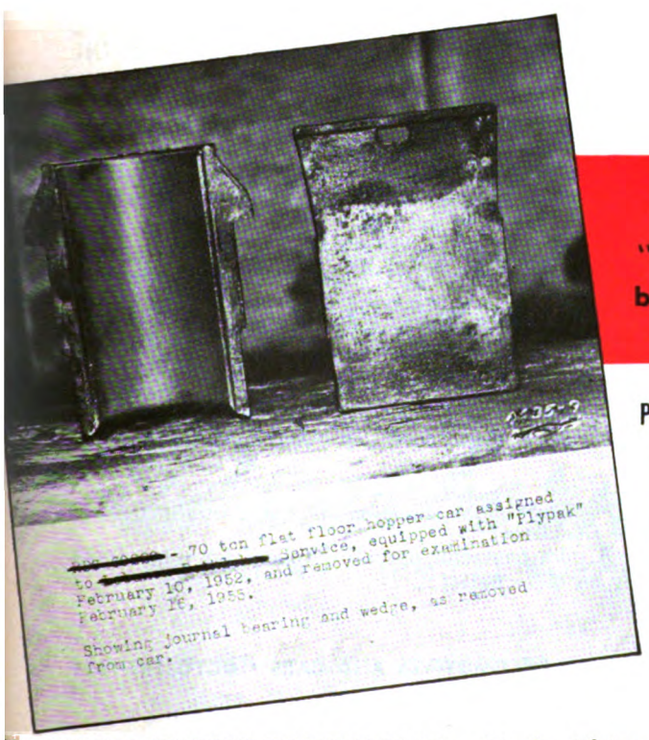

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Fairbanks-Morse
Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F319-Q—What is the purpose of the Brake Warning Relay?
A—It is a voltage relay connected across one set of braking resistor grids to indicate when current is excessive.

F320-Q—What is the function of the Traction Motor Field Shunting Relay Backward Sequence?
A—Opens shunting contactors two at a time.

F321-Q—How does the Current Relay function?
A—This relay is energized by main generator current to operate backward shunting sequence. When open, it de-energizes traction motor field shunting relay.

F322-Q—What is the setting of the current relay?
A—2400 hp units—1900 amperes. Other units—1750 amperes.

F323-Q—What is the purpose of the Magnet Valves, Contacts and Interlocks on the cam switch?
A—Changes main power and control circuits from motoring to dynamic braking and vice-versa.

F324-Q—What is the purpose of the Cam-Switch Pressure Switch?
A—This is an air pressure switch to prevent cam-switch from throwing to "Motoring" unless there is ample control air pressure (used only on units equipped for dynamic braking).

F325-Q—What is the setting of the Cam-Switch Pressure Switch?
A—55 pounds.

F326-Q—What is the function of the Air Compressor Synchronizing Magnet Valve?
A—When energized by air compressor governor switch, it operates unloader to load the air compressor. It also energizes train line wire to load all compressors simultaneously.

F327-Q—How does the Air Compressor Governor Switch function?
A—Energizes the air compressor synchronizing magnet valve.

F328-Q—What are the closing and opening pressures?
A—Closed by main reservoir air pressure at 130 psi; Open at 140 psi.

F329-Q—How does the Dynamic Brake Interlock function?
A—Releases or prevents an automatic service (not emergency), or electro-pneumatic straight air application on the locomotive, while the dynamic brake is in operation.

F330-Q—How does the Dynamic Brake Nullifying Switch operate?
A—Operates to nullify dynamic brake in event of brake-valve-initiated emergency but not on a train-initiated emergency application.

F331-Q—What kind of a switch is this?
A—A pressure switch on air brake equipment rack.

F332-Q—How does the Dynamic Brake Nullifying Relay function?
A—Nullifies dynamic brake when energized by the dynamic brake nullifying switch.

F333-Q—How can it be reset?
A—Selector handle must be returned to "OFF" to reset.

F334-Q—What is the purpose of the Exciter Field Contactor?
A—Energizes battery (4 pole) field controlling exciter and hence main generator output.

F335-Q—When does this contactor close when motoring?
A—When throttle is in Notch No. 1 or above.

F336-Q—When does it close when dynamic braking?
A—Closes with throttle selector in "BRAKE".

(Bulletin 1706, 132A, Page 6)

F337-Q—What is the function of the Exciter Field Reduced Contactor?
A—Inserts 40 ohm resistance in exciter field when de-energized by either wheel slip relay. Also energizes governor ORS to send load regulator to minimum field.

F338-Q—How is the Engine Temperature Switch (ETS) connected?
A—Connected to thermo-bulb in engine water outlet manifold.

F339-Q—What is the setting of this switch and how is it indicated?
A—Set to close at 195 degrees F. Sounds alarm bells in all units and lights red light on engine control panel.

F340-Q—What is the duty of the Field Loop Contactor?
A—Controls dynamic brake field loop excitation circuit.

F341-Q—When is the contactor energized?
A—On leading unit only, when the throttle selector is in "OFF" or "BRAKE" and reverse handle in "FORWARD" or "REVERSE".

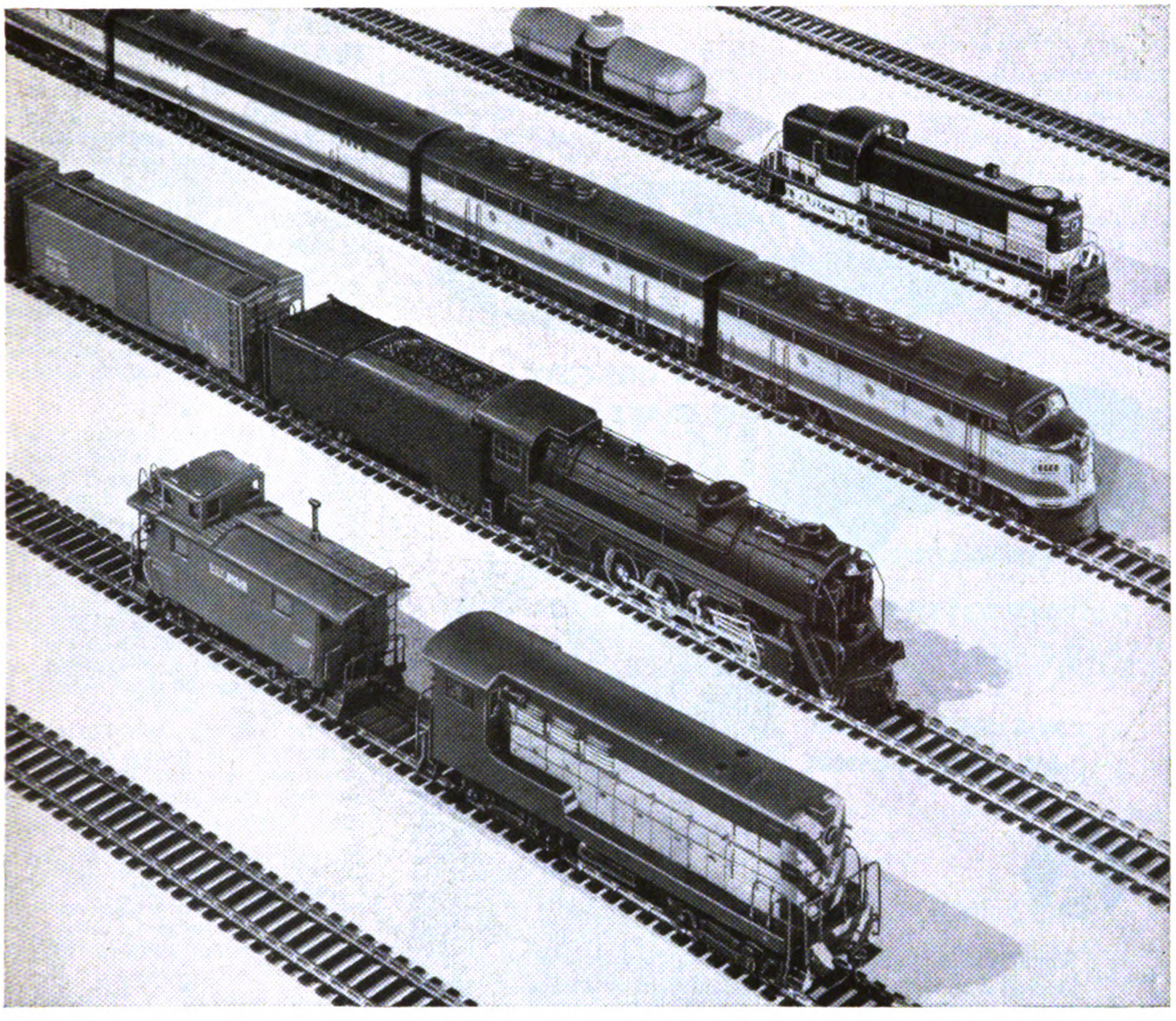
F342-Q—How do the magnet valves, contacts and interlocks on the reverser function?
A—Change direction of current through traction motor fields operate in propulsion and sanding control circuits.

F343-Q—What does "FOR" indicate?
A—Indicates those normally closed in "forward".

F344-Q—What does "REV" indicate?
A—Indicates those normally closed in "reverse".

F345-Q—How does the Fuel Pump Contactor operate?
A—Connects fuel pump to Control Cut-Out breaker. Utilized to energize each fuel pump from its own battery.

F346-Q—What is the function of the Forward Reverse Pilot Contactor?
A—A pilot contactor operating time delay relay (used only on older units).



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Simplified installation and strong, tough connections are assured with Watson-Stillman Socket-Welding Air Brake Flanges. Machined from tough steel forgings, these 2-bolt oval flanges are now available in two designs—each interchangeable with other air brake flanges. The W-S One-Piece flange, now standard equipment on many railroad cars, provides a strong, leak-proof joint with maximum resistance to shock and vibration.

The recently developed 2-piece Swivel-Joint Flange was designed to facilitate bolt-hole alignment. The flange can be rotated on the insert to any position until bolt holes line up. The Swivel-Joint flange permits most of the piping to be fabricated in the shop.

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R2

SUPPLY TRADE NOTES

(*Continued from page 90*)

chanical engineer of the Northern Pacific at St. Paul, has been named chief engineer for Stran-Steel transportation products. *O. S. Laing*, sales representative at Detroit, has been appointed Chicago district manager, and *John A. Ferguson* has been appointed district manager at New York.

■

HARVEY D. WELCH LUMBER COMPANY.—*Robert L. Belt* has been appointed sales manager. The company furnishes lumber supplies for railroad car shops. Mr. Belt was formerly vice-president of Mather Stock Car Company.

■

JOSEPH T. RYERSON & SON.—*Allen P. Beckloff*, manager of the tubular products and cold finished bar division of Ryerson, has been appointed manager of the Boston steel service plant, succeeding *Park Sanderson*, retired.

■

CHROMIUM CORPORATION OF AMERICA.—*Fay Thomas*, formerly general superintendent, diesel-electric, of the New York Central, is now associated with the Chromium Corporation as manager of railroad sales for the Cleveland plant.

■

TOLEDO PIPE THREADING MACHINE COMPANY.—*C. E. Hartsing* has been appointed manager of field sales, with headquarters in Toledo. Mr. Hartsing was previously western sales manager.

■

VANADIUM CORPORATION OF AMERICA.—*Joseph H. McGraw*, sales office manager at New York, has been appointed assistant district manager, Cleveland district. He has been succeeded by *Daniel A. Hackett*.

■

BUDD COMPANY.—*Griscom Bettle, Jr.*, a member of the sales project staff specializing in demonstration of the Budd rail diesel car, has been appointed sales representative of the Railway division.

■

PULLMAN COMPANY.—*James F. Flannery*, mechanical assistant, has been appointed general superintendent of shops.

■

GRIFFIN WHEEL COMPANY.—*Goff Smith*, manager of railway specialties sales, American Steel Foundries, has been appointed executive vice-president of Griffin, a subsidiary. *Roger G. Kimber* succeeds Mr. Smith.

■

STRATOFLEX, INC.—*W. D. Rothell*, sales engineer at Kansas City, Mo., has been named West Coast district manager at Los Angeles, succeeding *A. B. Quinn*, resigned.

Obituary

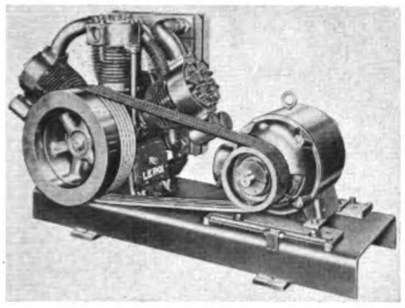
HARRY D. SHAW, 60, railroad service representative for National Aluminate Corporation, died August 9.

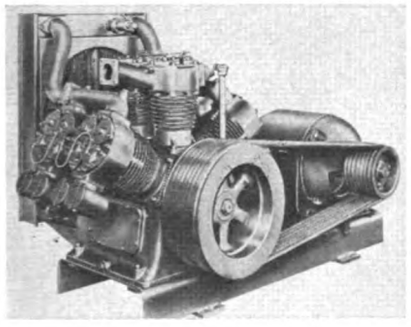
■

HERBERT J. FRENCH, 62, vice-president of International Nickel Company and assistant vice-president of International Nickel Company of Canada, died August 17, at Rochester, Minn.

NEW DEVICES

(Continued from page 10)

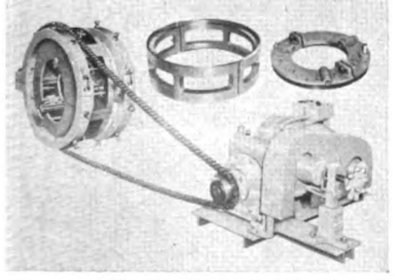




Motor-Driven Compressors

These two-stage, air-cooled, electric motor-driven compressors, with 50, 75 and 100 hp ratings, have displacements of 260, 415 and 550 cfm at 125 psi operating pressures. The three-cylinder Model 5OS2 and six-cylinder Models 75S2 and 100S2 have a balanced design which reduces vibration and noise to a minimum.

The cylinders of alloy iron are cooled by a belt-driven fan which draws air through a sectional-core intercooler. Each bank of cylinders has individual intake filters. Standard equipment includes a dual control which gives the operator a choice of start-and-stop duty of both motor and compressor or a continuous running of motor with intermittent compressing. *Le Roi Division, Westinghouse Air Brake Company, 1706 S. 68 street, Milwaukee.*



Diesel Crankshaft Refinishing Tool

The Model C refinishing tool can be used to finish crank pins within the engine and without removing the crankshaft. It is said to be equally well adapted for use in engine overhaul shops where many engines are completely dismantled.

The device runs on two split adapters that bolt on to crankcheeks. The unit, itself, is built in halves, one half carrying the cutting bits and the other half carrying the honing stones. Accuracies of less than 0.001 in. in roundness and finishes of 32 micro in. are quickly obtained. The tool is available in five sizes for crank pin diameters of 4 to 20 in. *Aero-Motive Manufacturing Company. 1803 Alcott street, Kalamazoo, Mich.*

Electrician Tools

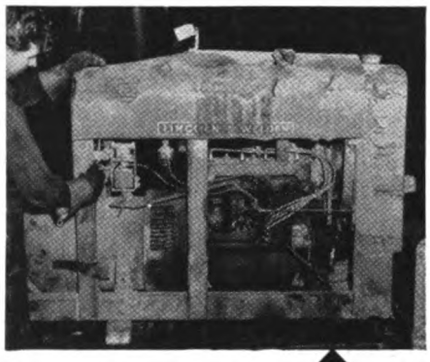
A skinning knife with a plastic insulated handle is one of two new tools for electricians. Its blade is 3 in. long, fabricated from tempered cutlery steel. The handle provides insulation from shock and a comfortable grip and is red in color. The back of the blade is flat for scraping, and the bevel of the blade overcomes build-up of insulation when skinning weatherproof insulation. It has a ring on the handle for fastening to a snap.

(Continued on page 104)

"LINCONDITIONING"

LINCOLN FACTORY REBUILDING

provides new welder performance from your old machines AT LOW PRICE!



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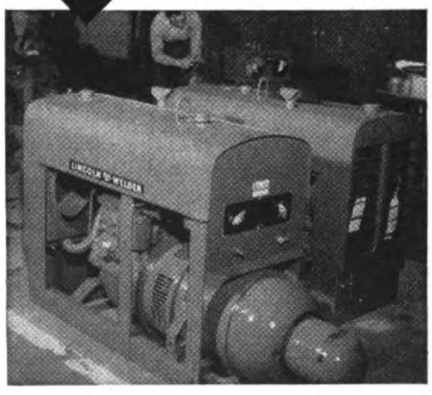

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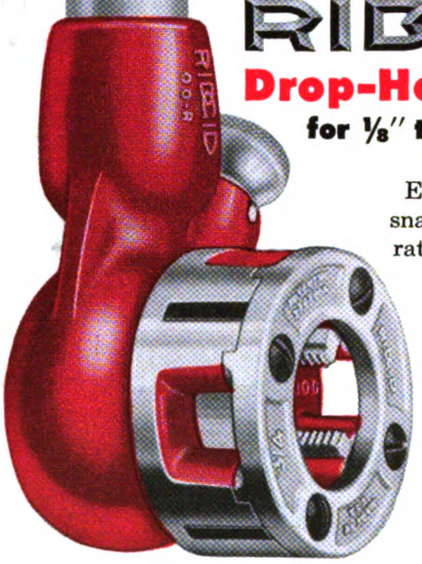

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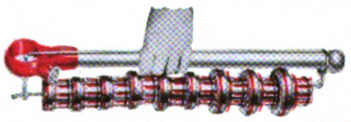

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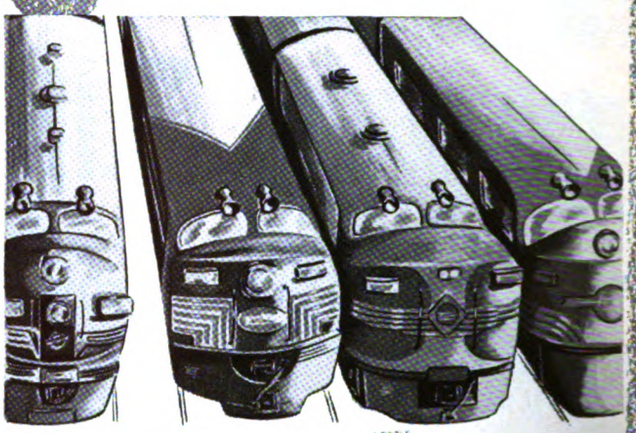

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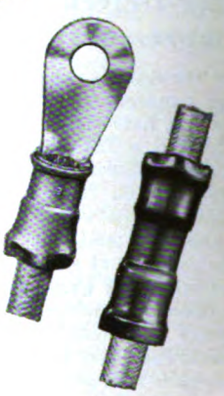

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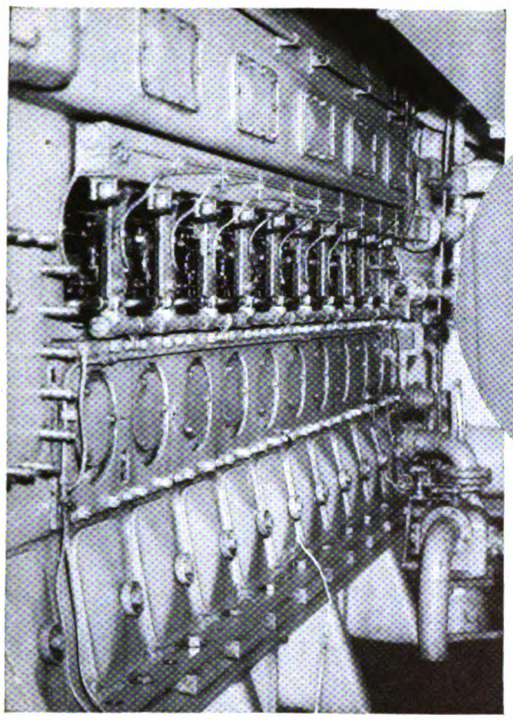

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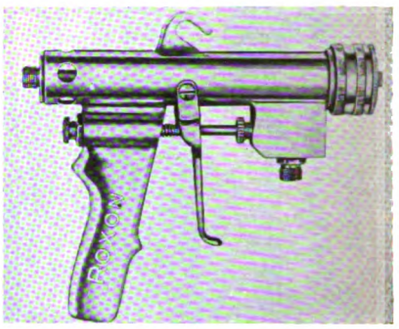
The second device is a plier, with plastic dipped handles, which, according to the manufacturer, provide a heavy plastic coating that is resilient to the hand and will not come off in use. Available in red, blue, black, yellow or green. *Mathias Klein & Sons, 7200 McCormick road, Chicago 45.*



Spray Paint Conversion Gun

With this unit it is possible to instantly convert high pressure paint spray systems to low pressure. Conversion is made possible by use of spray gun that is attached to standard high pressure air and paint hoses.

The unit, Model 501 Volumaire, handles all standard paints, varnishes, lacquer emulsions, lacquers, enamels or white washes with either internal or external atomization and produces a round or flat jet, ½ in. to 16 in. wide. Air at the rate of 50 psi and 6 cfm is automatically converted by a venturi in the gun to 1-½ psi and 60 cfm thereby eliminating backspray, overspray and spraydust. It is possible to spray indoors and outdoors without masks, goggles or spray booths. *Roxon, Inc., 50 Broad street, New York 4.*

Railroad Radio Control Head

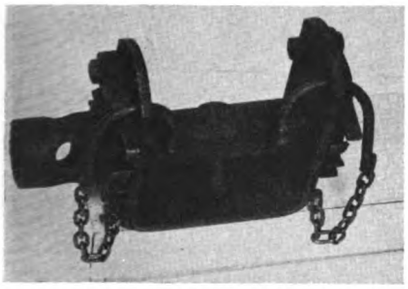
A railroad radio control head, said to provide savings in time, labor, and expense in an original installation, has a weatherproof, bakelite-impregnated-cone speaker which is an integral part of the control unit. It eliminates the need for a separate

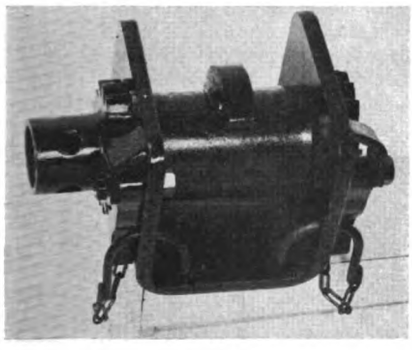
speaker installation, thus reducing installation space.

The control head is available in two models, one with automatic frequency reverting, and the second with a provision for two frequencies but no automatic reverting. The head is interchangeable with previous mechanical and electrical control heads made by the manufacturer. It is recommended for use with a 64-volt power supply. *Motorola Communications & Electronics, Inc., Railroad Department, 4501 Augusta boulevard, Chicago 51.*

Tank-Car Cleaner

Fogging unit, Model 523, offers a time-saving method of cleaning tank car interiors without manual brushing. It consists of two opposing, stationary nozzles mounted on the end of a long twin-tube structure, which is placed in dome of tank car for cleaning. Steam and detergent solution are fed to the nozzles, where the two combine and are sprayed on interior surfaces. Spray comes from the nozzles in the form of a detergent-saturated steam fog which settles on the soils. Detergency plus melting action of the steam provides cleaning action. The unit is easy to install, and operate, and is used also for rinsing. *Oakite Products, Inc., 19 Rector street, New York 6.*

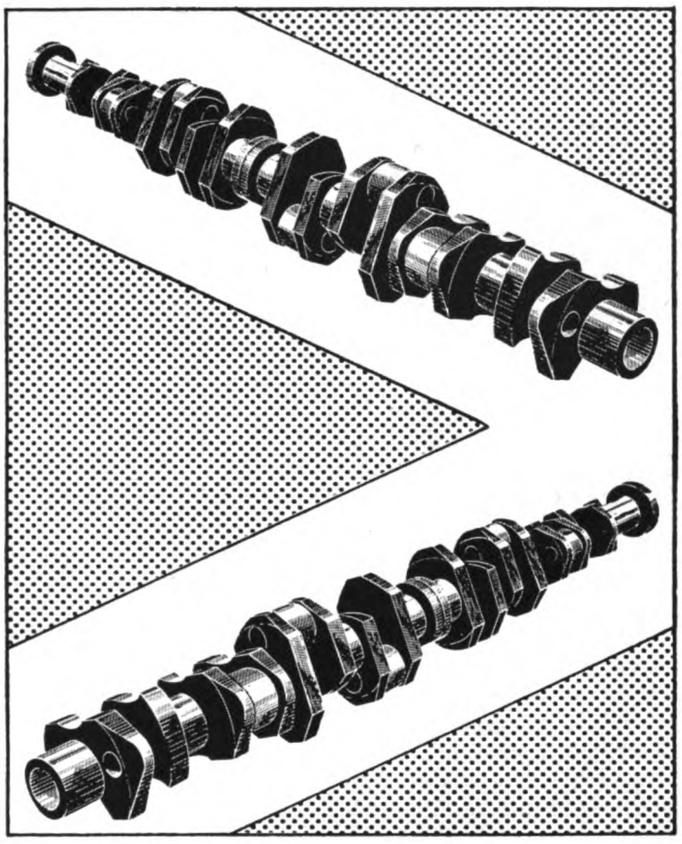




Piggy-Back Tie-Down Devices

Two tie-down winches for anchoring highway trailers on flat cars, are built on ⅝-in. one-piece steel frames, and are tightened with a bar passed through holes in a drum extension at one end. The drum in both models is held in a fixed position by ratchet pawls. The model 6458TB tie-down winch, for anchoring at each end of a trailer, is designed to absorb the longitudinal shocks

CRANKSHAFTS



Chromium Plated

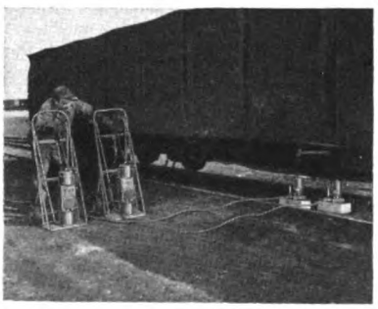
by

VAN DER HORST

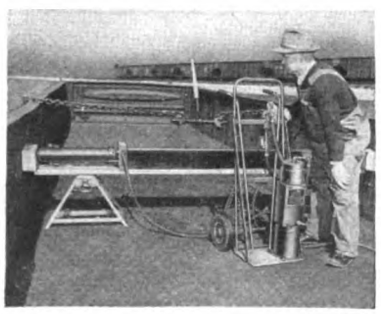
OLEAN, NEW YORK TERRELL, TEXAS

This Duff-Norton 30-TON capacity jack operates from any air supply of 80 to 100 lbs.—portable—offers choice of any or all of 5 interchangeable hydraulic rams, each totally enclosed in special "grit guard" for long, trouble-free operation in any position. Ram can be stopped precisely and instantly at any position when raising or lowering by removing finger from spring loaded air valve mounted on truck. Safe, economical, easy to use, these new air-hydraulic jacks are winning new friends in railroad shops everywhere.

For complete specifications, write today for Bulletin AD 25-G, to the world's oldest and largest manufacturer of lifting jacks, Duff-Norton Company, P. O. Box 1889, Pittsburgh 30, Pennsylvania, Canadian Plant —Toronto 6, Ontario.



1. Loads go up or down quickly.



2. The operator is always safe.

DUFF-NORTON

"Giving Industry A Lift Since 1883" **Jacks**

developed in train operation. Anchor cable up to ¾-in. is fastened to an outer drum. An arrangement of vanes and rubber elements between this drum and the inner drum provides the snubbing action. There will be a cable movement of 1½-in. with a load of 30,000-lb, and then the rubber ceases to cushion the load. The subsequent metal-to-metal contact has been tested up to 50,000-lb loading.

The 6M4 winch is designed for tie-down across the car and does not incorporate the outer drum and rubber snubbing. Up to ¾-in. cable can be wound directly on the inner drum. The use of these devices is said to greatly speed trailer tie-down. *Brandon Equipment Company, 323 S. Michigan Avenue, Chicago.*

Hydraulic Riveting Gun

The ½-in. Huckbolt can be driven with this compact, lightweight, rugged hydraulic pull gun. Few moving parts and heat treated steel contribute to the long life of this 14½-lb tool. It has a working stroke of ⅝-in. and a rate of 50 to 60 strokes per min. The fasteners are driven successively without turning the gun on and off each operation. The Huck power cell drives this tool. *Huck Manufacturing Company, 2480 Bellview avenue, Detroit.*

Insulating Structural Reinforcement

Urethane foam as a core material combines lightness, strength and rigidity. The aircraft industry has made extensive use of this material as a lightweight reinforcing core between metal skins. The structural members so formed have a high strength-to-density ratio and are very lightweight. One of the outstanding applications of urethane foam is that is can be foamed in place to fill any cavity regardless of the shape. This eliminates the need for cutting and shaping.

The foam is produced by mixing two liquid components at room temperature and pouring the resulting mixture into the

Always an operating hazard—and a constant drain on the maintenance budget—rust is a doubly dangerous enemy now when it is difficult to obtain metal replacements.

RUST-OLEUM stops rust effectively—is the practical answer to many railroad rust problems. Its tough, pliable, rust-resisting film gives excellent protection to bridges, rolling stock, metal buildings, signal equipment, tanks and many other rustable metal surfaces.

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RUST-OLEUM cuts maintenance costs in two ways. (1) It prevents rust on new rustable metal surfaces so that costly replacements can be deferred longer than previously could be expected. (2) Because RUST-OLEUM can be applied *even* over metal already rusted—usually without sandblasting or the use of chemical rust removers—it saves many, many man hours. *Write for your copy of the NEW RUST-OLEUM Railroad Catalog.*

"Rigid economy, Mon!"

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Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number(s) on coupon below to receive desired information. Requests will be forwarded direct by the manufacturers.

1. PORTABLE CORDS. *Anaconda Wire & Cable Co.* 8-page 2-color brochure (DM-5538) describes, illustrates and gives specifications for "Anaconda Portable Cables", Securityflex for rugged applications, Industrial for severe industrial uses, and Service for hard service applications.

2. ELECTRIC CABLE VULCANIZERS. *Joy Manufacturing Co.* 16-page 3-hole punched bulletin (B-48a) "Joy Electric Cable Vulcanizers Keep Cable Upkeep Down, Save Power, Time & Lives", describes and illustrates newest addition to Joy line of electrically-operated cable vulcanizers.

3. FREIGHT CAR ENAMEL. *Sherwin-Williams Company.* 4-page 2-color brochure (S 3495) "New One-Coat Cold Spray The Equal of Two Standard Coats" describes the new synthetic freight car enamel Kem Kold Bild.

4. SILICONE RUBBER. *Dow Corning Corp.* 4-page 2-color folder (9-102) "Design Longer Life and Greater Efficiency Into Your Products With Silastic, The Dow Corning Silicone Rubber", in five sections details properties and performance.

5. STORAGE BATTERIES. *Gould-National Batteries, Inc.* Additional material available on storage battery selection, charging, handling, maintenance, inspection and testing for starting diesel locomotives in the Plus-Performance Plan.

6. ARC WELDING CONTROL. *Worthington - Mullenbach Controls Div. Worthington Corp.* 4-page 3-hole punched bulletin (R-1700-B 17) on Arctrol (portable, remote control) for arc welding machines illustrates, gives application data, and describes simplicity of operation.

7. GEARS. *Foote Bros. Gear and Machine Corp.* 24-page 3-hole punched catalog "Foote Bros. Facilities," Foote Bros. facilities for manufacturing precision gearing and complete power transmission mechanisms.

8. SEALED JOURNAL BOX. *National Motor Bearing Co.* 28-page pocket sized maintenance manual (303) "Instructions for Installing and Servicing NMB Sealed Journal Box Kit" for railroad mechanical personnel includes in four sections: description, installation, maintenance and emergency operation data.

9. INDUSTRIAL FIBERS. *The Pacific Lumber Co.* 4-page folder (502) "Palco Industrial Fibers" describes, illustrates, and gives industrial applications and physical and chemical properties of four "Palco" industrial fibers produced from redwood and redwood bark; samples of each fiber included.

10. MILLING MACHINES. *Axelson Manufacturing Co.* Bulletin describes and illustrates the new Axelson Models 10R Ram Turret Vertical Milling Machine and 10RH Ram Turret Duplex Milling Machine; points out features.

11. BABBITT METAL. *Graphitized Alloys Corp.* 4-page brochure announces and describes graphite-containing lead-base babbitt "Grac"; describes ten outstanding advantages; includes proven uses, outline of proper use, outstanding properties, composition and mechanical properties.

12. METAL FABRICATOR. *Kling Brothers Engineering Works.* 6-page Complete Line Bulletin (100) "Kling Metal Working Machinery" illustrates and describes the basic Kling models for over 50 different machines for metal fabricating.

13. SHEAVES. *Allis-Chalmers Mfg. Co.* 4-page 3-hole punched bulletin (20B6082C) "Allis-Chalmers Texrope Drives, Vari-Pitch Sheaves" describes and illustrates stationary and motion control Vari-Pitch sheaves.

14. LATHE CALCULATOR *(Price $1.00). Cincinnati Lathe & Tool Co.* New turning calculator (catalog T-127) aids selection of lathe feeds and spindle speeds for most rapid turning (side labeled "Lathe Set-Up Calculator") and helps determine most economic cutting speed (side labeled "Economic Cutting Speed"); these unique turning calculators complete with instruction book *available for $1.00 for each set.* Payment *must* accompany request!

15. VERTICAL TURBINE PUMPS. *Layne & Bowler Pump Co.* 8-page 2-color bulletin (100) "L & B Verti-Line Pumps for industrial and municipal primary water supply" describes and illustrates Layne & Bowler Verti-Line Primary water supply pumps; sectional drawings with enlarged views describe products.

16. TEMPERATURE INDICATORS. *Tempil Corp.* Revised 6-page 2-color catalog (541) describes and illustrates complete line of crayons that tell temperatures; discusses how crayon mark melts when desired temperature is reached.

Reader Service Department **OCTOBER, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

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Also, please send me additional product information as follows: (company, product & page number) .....

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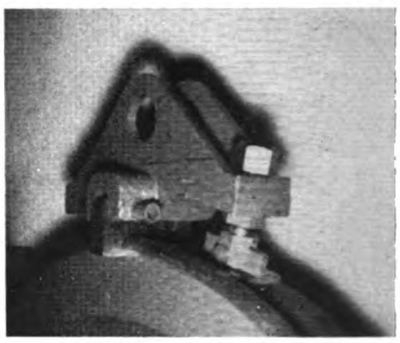
space to be filled. A product will result whose physical properties and characteristics are predictable and reproduceable without complicated equipment or handling. This means lower costs in equipment, storage, handling and fabrication. When set, Urethane foam supports the walls enclosing it at every point on their inner surfaces and is strongly adhered to them.

These foams have a thermal insulating value twice that of cork. They are water-resistant, rot and fungus proof, chemically inert and absorb sound and vibration. They can be drilled, sawed, milled or sanded. The material has been recommended as a core material for passenger, box and refrigerator cars. Already several refrigerator car installations have been made. *Nopco Chemical Company, Lewis and Carter streets, Harrison, N. J.*



Flange Turner

Depth of cut with the Transall Model HH-2 Flange turner is controlled by adjustment of the two pads that run on the tread of the wheel. The device, designed to cut down high flanges without removing diesel locomotive wheels, is installed in place of the brake head at the wheel to be worked. Both flanges on a single wheel set should not be turned at the same time. If all the wheels on a truck must be machined, then the turners should be applied at diagonally opposite corners.

The operation is done with a brake cylinder pressure of 20 psi and a locomotive speed of about 5 mph. It is said that actual machining time is about 30 min. *Transall Inc., Railway Division. P.O. Box 1588, Birmingham 4, Ala.*

Brake-Cylinder Lubricators

Lube-Rings and Lube-Strip lubricators are made from graphited porous rubber and felted cotton fibers. When these rings or strips are used in brake cylinders and around the hollow rod, the continuous flow of graphite lubricating material forms a long wearing, frictionless, sliding surface. The lubricators are said to eliminate possible piston-cup swelling encountered when using petroleum-base cylinder lubricants.

They are manufactured to close toler-

ances for precision fit around the air brake piston and hollow rod. A built-in resilient property maintains even pressure of the lubricator with the surface to be lubricated. *Gustin-Bacon Manufacturing Company, 210 W 10th street, Kansas City 6, Mo.*

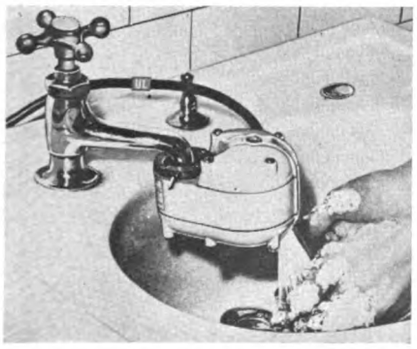
Crankshaft Grinding Refinement

Crankshafts are floated on air at the main bearing journals to allow them to lie straight and parallel during the grinding operation. Recently installed equipment known as the Precision crankshaft balancers are now part of the grinding machines operated by this supplier at plants in Los Angeles and Mt. Vernon, Ill. With all the crankshaft weight removed from the grinder, the shaft lies straight to eliminate all stresses and sag during the grinding of both the connecting rod and main bearing journals. It is said that this permits grinding to much closer tolerances. *Precision Engineering Company, 1717 E. Slauson avenue, Los Angeles.*

Slabbed Head Set Screw

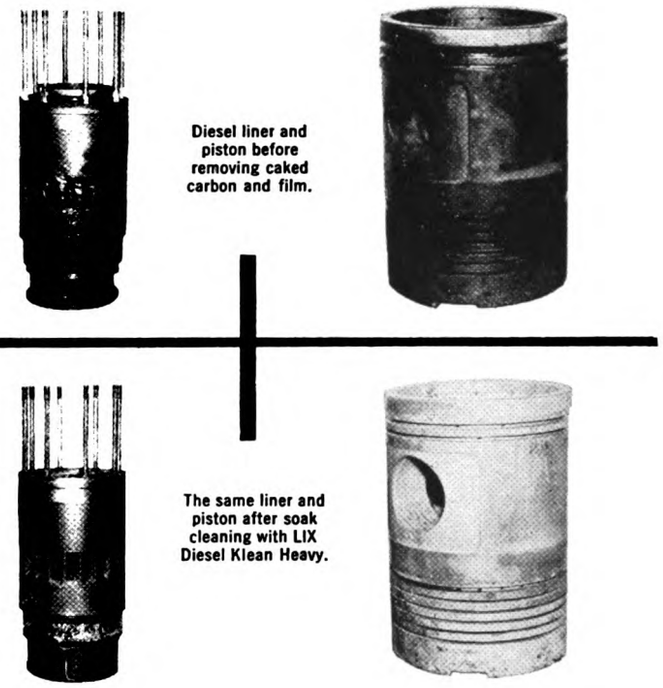
The Flush-Lok is designed to extend the inherent strength of slabbed head set screws to cover applications in which the slab portion cannot extend beyond the tapped hole. It retains a positive locking action in all positions. Being flush with the surface, the screw is practically tamper-proof as well as resistant to accidental removal.

The screw is made with an undersize slab to permit flush insertion. Supplied in the manufacturer's Nu-Cup design, it offers the holding power advantages of a 42 per cent sharper angle and is suitable for hopper feeding. *Set Screw & Mfg. Co., Main street, Bartlett, Ill.*



Faucet Water Heater

The Thermjet attachment is applied to standard faucets up to 15/16 in. size without tools and is readily transferred from one faucet to another. It is said to produce hot water from the coldest supply within two seconds. The long water path made of



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It's time you asked:

What's behind the success of aluminum bearings?

Since Alcoa first introduced them in 1938, aluminum bearings have been making deep inroads where bimetallic bearings were considered standard. Little by little, management groups in all industries have seen competitors' problems solved by the adoption of them—and hundreds have asked, "What IS behind the success of aluminum bearings?"

For one thing, aluminum bearings are *one piece.* Heat is evenly distributed, quickly dissipated. The relative softness of aluminum bearing materials prevents scoring of shafts by dirt particles. Yet aluminum is hard enough to groove slightly, and "roll out" particles, and allow them to be trapped by the oil filter. What's more, these long-lasting bearings in many cases actually *cost less than the bearings you're now using!*

Alcoa's team of research and development engineers spent years in the development of this special bearing alloy. These men, already familiar with the railroad industry, knew the alloy must have optimum resistance to corrosion; must offer the last word in load-carrying ability.

Working hand-in-hand with Fairbanks-Morse, these Alcoa engineers developed, machined and installed the world's first aluminum bearings for diesel locomotives. Now, after years of trouble-free experience with them, Fairbanks-Morse specifies Alcoa® Aluminum Bearings for the full engine set in their great new TRAIN MASTER Locomotive!

So, it's time you asked, "What's behind the success of aluminum bearings?"—and the man to ask is the Alcoa sales engineer, or call your nearby Alcoa sales office. The number is listed under "Aluminum" in the classified section of your telephone directory. Or write: ALUMINUM COMPANY OF AMERICA, 1986-K Alcoa Building, Pittsburgh 19, Pennsylvania.

Your Guide to Aluminum Value

FASTEN ALUMINUM WITH ALCOA ALUMINUM FASTENERS

AIR engineering at work
REPORT No. 4400.05

Running Ten Nuts at a Crack...

SAVES $12,000 *a year!*

This large auto manufacturer formerly used two ¼ ton presses to position a differential carrier in the rear axle housing. Then the ten ⅜" nuts were run individually. Only experienced operators could control torque so that it met specifications. Naturally the engineers wanted to eliminate the press operation and improve torque control.

AIR engineering by Ingersoll-Rand provided the answer and saved $12,000 a year. A 10-Spindle Multiple Nut Runner is now suspended over the moving conveyor. The differential carrier is hand set on the housing, and dropped to within ⅛" of its final location. The 10-spindle nut runner quickly and accurately draws it into final position as it runs all 10 nuts at once . . . and to the required 50 ft. lbs. torque. The press operation is eliminated, and simultaneous running of the nuts eliminates binding.

If you are in any way responsible for cutting costs in your plant, write us on your company letterhead, and we will arrange for you to see I-R's confidential manual of reports on "AIR engineering at work".

Ingersoll-Rand Multiple Nut Runner runs 10 nuts at once, all to exact torque.

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

AIR engineering Manual

Don't miss over 100 interesting case history applications of AIR engineering in this confidential manual.

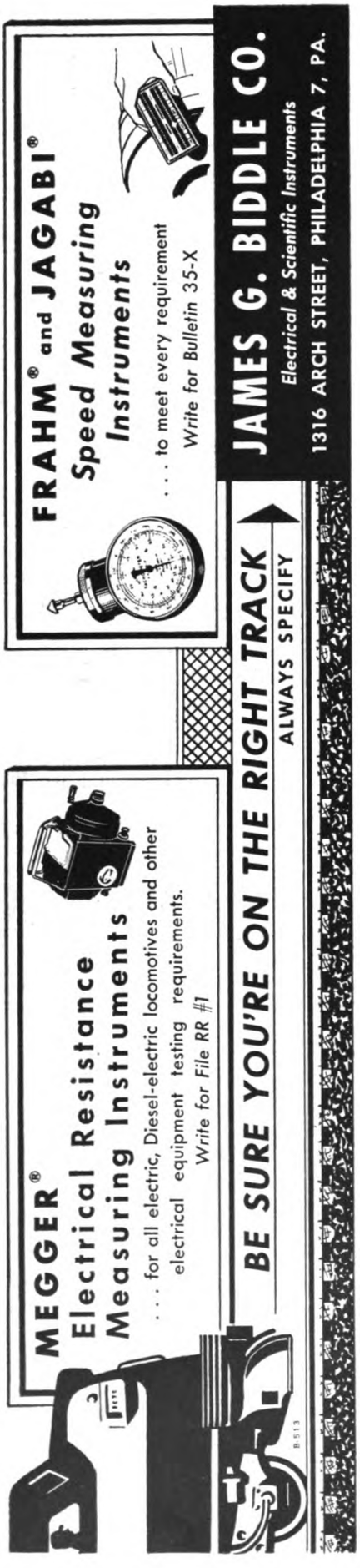
8-147

a series of winding constricted channels has an electrical resistance of over 500,000 ohms and permits a current flow of only ⅕ milliamp. The position of the faucet handle determines the water temperature. With the handle just opened, the water is steaming hot. Water temperature decreases as the faucet is opened. When the faucet is completely closed, there is not current flow even though the unit is still plugged in. The Thermojet weighs 3 lb and measures 3 x 4½ in. *Greatex Products, Inc., 890 Sixth avenue, New York 1.*

Flashing Warning Light

Type 15360 Gyralite warning signals are for use on moving equipment such as diesel switcher locomotives, cabooses, cranes, and material handling shop trucks. The beam of the sealed beam lamp is reflected at right angles by the dual inclined plane reflector which revolves at 48 rpm, projectioning 96 flashes per minute in a horizontal plane. The reflector is mounted directly to the geared motor shaft which is conducive to low maintenance because all moving parts are motor components.

A three-wire terminal block is provided in the base for the motor and lamp leads. The lamp is readily accessible through the gasketed hinged door at the top. Various colors are available. *Pyle-National Company, 1334 N. Kostner Avenue, Chicago.*



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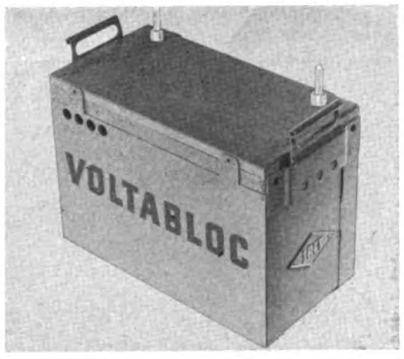

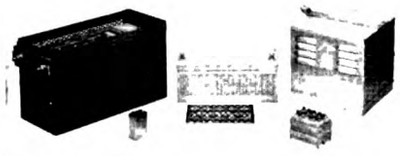

Sealed Nickel-Cadium Battery

The Voltabloc, a hermetically sealed battery, is said to increase service life, dependability and operating economies. This device operates on a non-self-destructive principle, using sintered nickel and cadmium plates that are compressed in a welded metal case. Low internal resistance results in peak discharge rates up to 20 times rated capacity with high usable end voltage.

Being hermetically sealed, they are said to be maintenance-free and have a useful life up to 20 years. Sealing makes the unit leakproof and free from any corrosive gas discharges in normal operations. They can be located in confined spaces or close to delicate instruments without risk of damage. They are compact and occupy only one-fourth to one-fifth of the space filled by conventional starting batteries delivering similar discharge rates according to the manufacturer.

The batteries are said to be practically indestructible both electrically and mechanically under severe service conditions of shock, vibration, discharge or overcharge. Sizes range from 0.8 amp hr up to units for starting large diesel engines. Operations can be at temperatures from minus 40 deg F to plus 160 deg F. *SAFT Corporation of America, Lodi, N. J.*

Axle Journal Tools

Standard carbide-tipped tools and holders are now available for axle journal turning operations on Sellers lathes. With these inserted tools, reground tool bits can be placed in the holder, adjusted to original cutting dimensions and locked in place. The manufacturer claims that the user receives long tool life through adjustment, simplified and minimum grinding as well as low replacement cost of inserted tools. *Apex Tool & Cutter Co., 237 Canal street, Shelton, Conn.*

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that excel in

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Made to fulfill the need for a heavy duty cleaner and degreaser. Used for rugged jobs, under carriages and exteriors, running gear and surfaces — and areas subject to heavy oil, asphalt and other tenacious accumulations.

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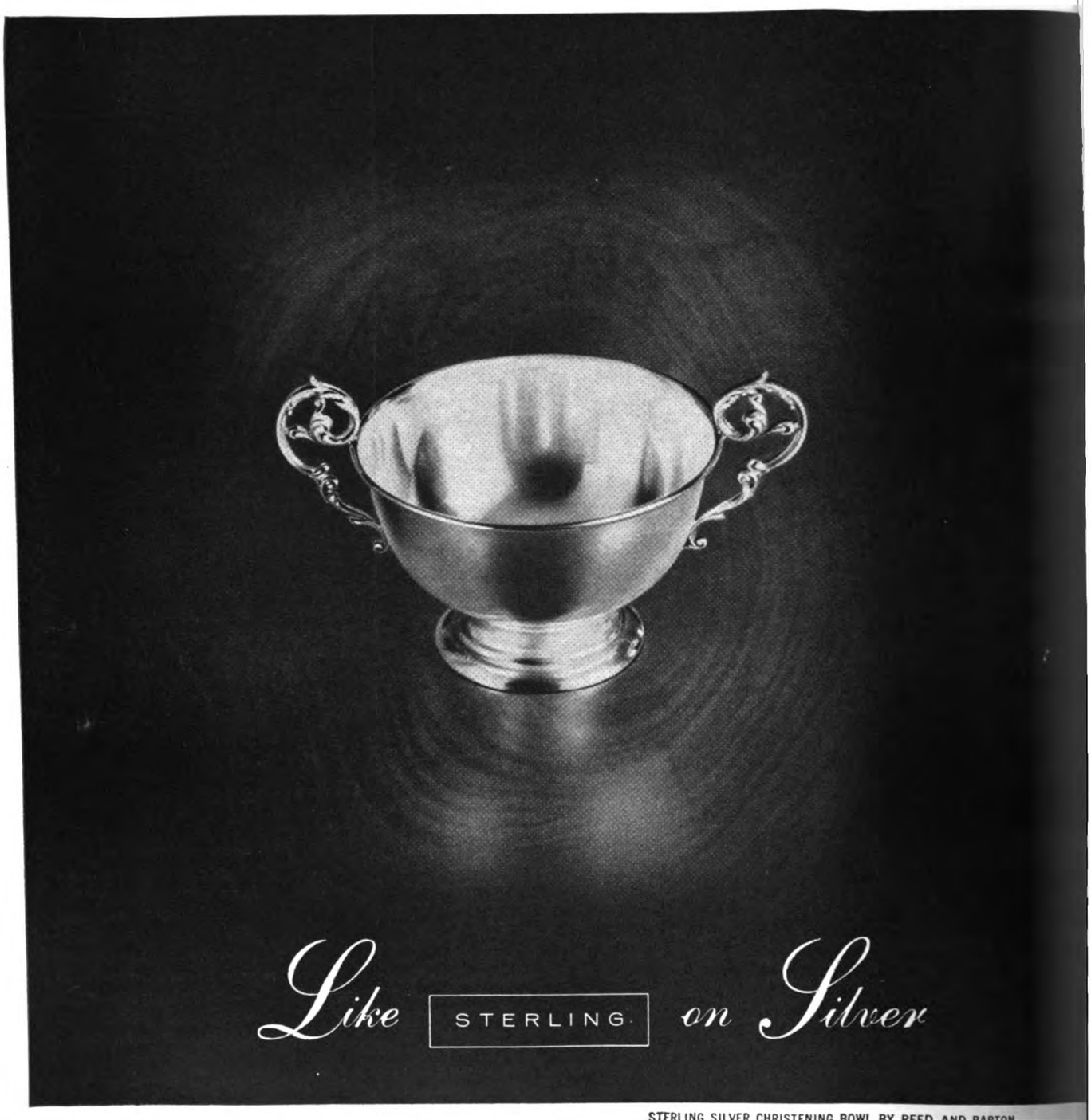

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NOVEMBER 1955

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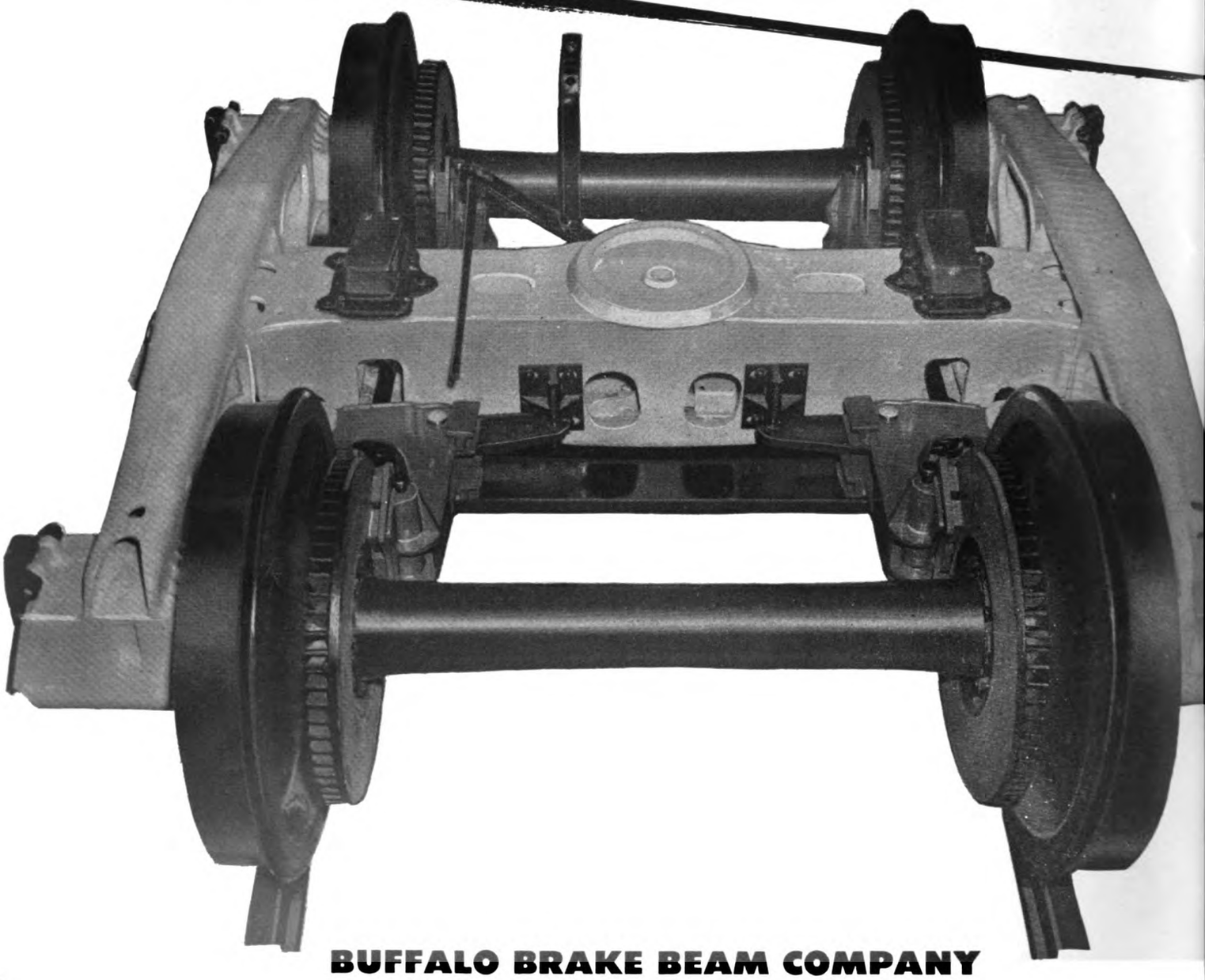

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Founded in 1832 as the American Rail-Road Journal

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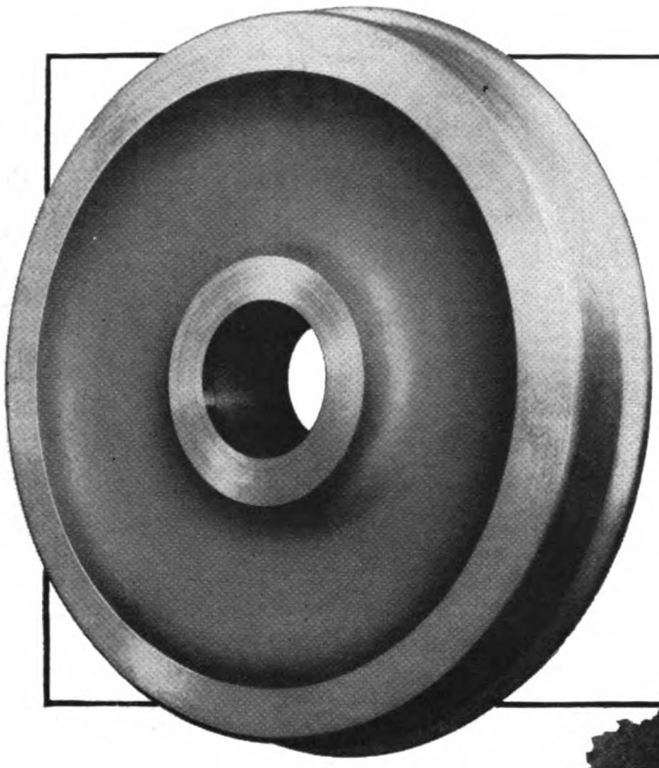
USS MULTIPLE-WEAR



Specifically designed for more mileage under heavier loads at higher speeds

UNITED STATES STEEL

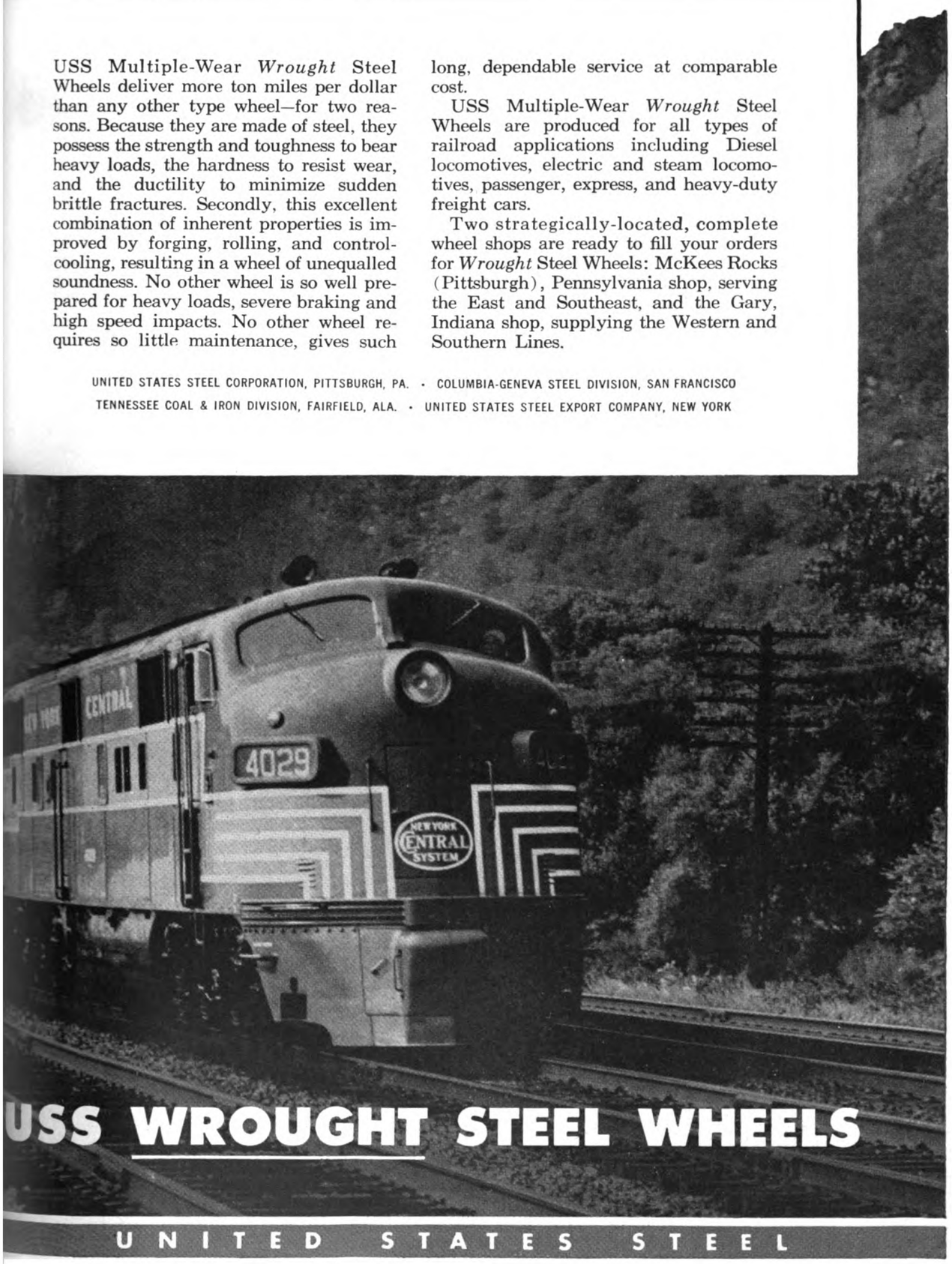
WROUGHT STEEL WHEELS

USS Multiple-Wear *Wrought* Steel Wheels deliver more ton miles per dollar than any other type wheel—for two reasons. Because they are made of steel, they possess the strength and toughness to bear heavy loads, the hardness to resist wear, and the ductility to minimize sudden brittle fractures. Secondly, this excellent combination of inherent properties is improved by forging, rolling, and control-cooling, resulting in a wheel of unequalled soundness. No other wheel is so well prepared for heavy loads, severe braking and high speed impacts. No other wheel requires so little maintenance, gives such long, dependable service at comparable cost.

USS Multiple-Wear *Wrought* Steel Wheels are produced for all types of railroad applications including Diesel locomotives, electric and steam locomotives, passenger, express, and heavy-duty freight cars.

Two strategically-located, complete wheel shops are ready to fill your orders for *Wrought* Steel Wheels: McKees Rocks (Pittsburgh), Pennsylvania shop, serving the East and Southeast, and the Gary, Indiana shop, supplying the Western and Southern Lines.

UNITED STATES STEEL CORPORATION, PITTSBURGH, PA. · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL EXPORT COMPANY, NEW YORK



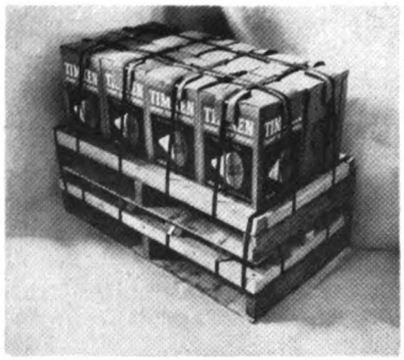
USS WROUGHT STEEL WHEELS

UNITED STATES STEEL

EQUIPMENT... *New Ideas—New Uses*

Bearing Packaging

The railroad bearing packaging system introduced by Timken assures a minimum of handling and a maximum of speed in supplying bearings. The complete pre-assembled, pre-adjusted and pre-lubricated railroad freight car bearing is packaged in a cardboard box. Eight such boxes, one car set, are placed on a single pallet. Eight



wedges or adapters also packaged in heavy-duty cardboard boxes are placed on another pallet. The palletized bearings are then placed on top of the palletized wedges or adapters and banded together. Freight cars are loaded so these pallets can be unloaded with a lift truck.

The bearings are unpacked from the cartons by removing two staples at the top of the package and lifting out the bolts and end cap. A rip cord around the bottom of the cardboard bearing package separates the end of the package from the middle package section. After the bearing is pressed into place, the remaining cardboard around the bearings falls away and the job is completed. *Timken Roller Bearing Company, 1835 Dueber avenue, SW, Canton, Ohio.*

Mobile Journal Jack and Brass Trimmer

A self-propelled combination jack and brass trimmer, the Yu-Brasser, has been designed to permit one man to raise car weight off the journal so that the wedge and brass can be removed for inspection. The brass can be trimmed on this truck, and then replaced over the same journal from which is was removed. It is claimed that this operation can be performed in two or three minutes, and that a full year's

test in one California yard showed inspection time cut in half. Because the brass worn to fit the journal is reused there, it is said that there were almost no hot boxes among the cars serviced.

The 2,600 lb truck is hydraulically driven with a two-cylinder, four-cycle air-cooled engine delivering 13 hp at 2,200 rpm. The engine drives a Vickers vane-type hydraulic pump operating at pressures up to 1,250 psi. To the right of his steering wheel the operator has a battery of four hydraulic control valves which control the following operations:

1. A hydraulic motor for driving the truck forward or backward through a chain drive.

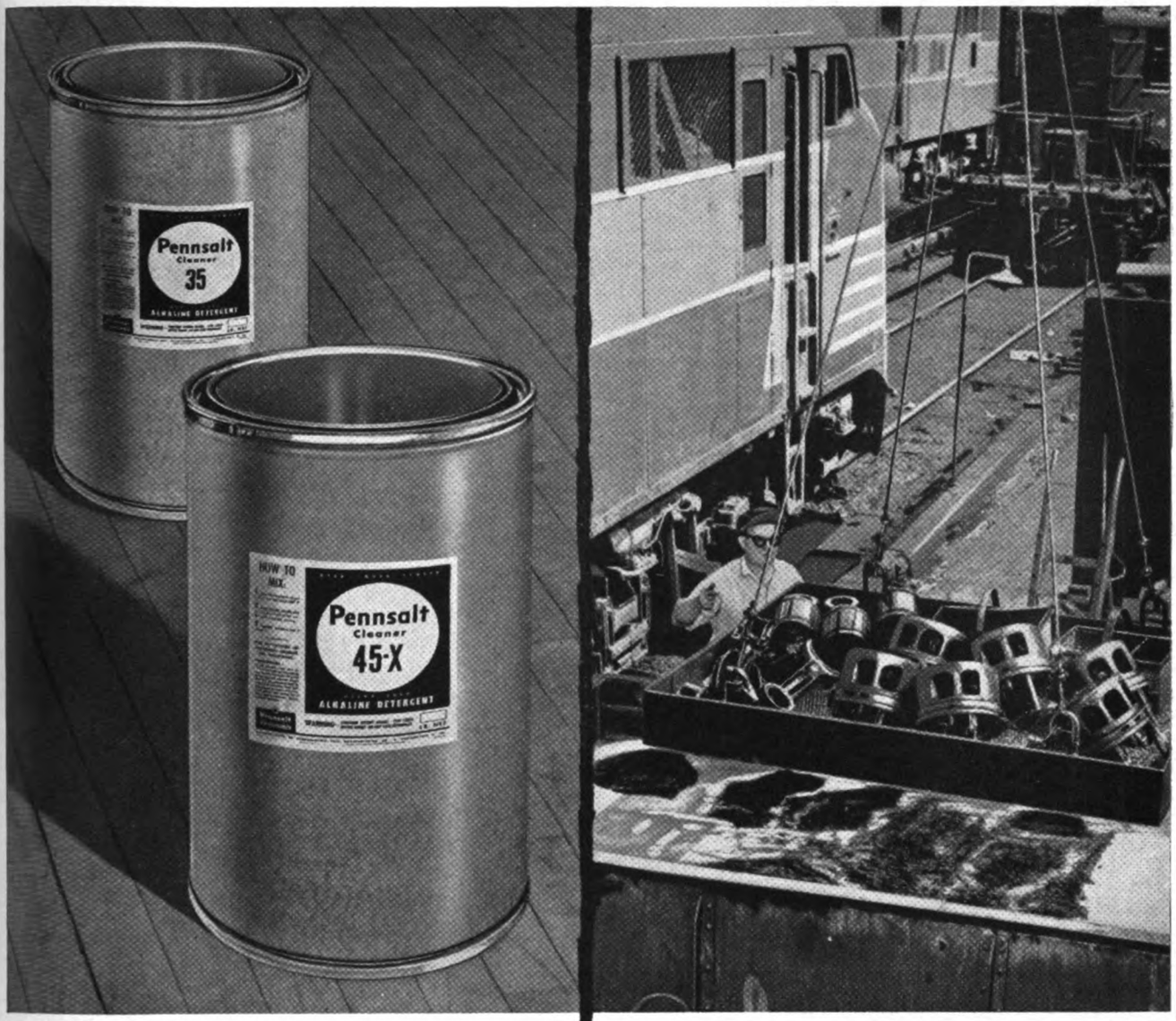
2. A single-acting hydraulic ram mounted at the end of the arm forward of the body about 3 ft. This ram is the jack. It is swivel mounted, and is said to raise 15 tons a maximum of 6-in. in six seconds.

3. A double-acting hydraulic cylinder connected to the ram arm to raise or lower the arm and ram about 10-deg from the horizontal.

4. A hydromotor geared to a pivot shaft and connected finally to the ram arm to move it approximately 50-deg each side of center.

On the front hood of the Yu-Brasser is a hydraulic shaper for removing the babbitt burrs. It has a stroke of 15-in. and is equipped with a special vise for holding the car brass during trimming. Control for this tool is located adjacent to the shaper on the hood. Brakes are foot operated as is the throttle. There is also a hand control for engine speed. The Yu-Brasser is complete with electric starter, generator, battery, horn, spotlight for night service, and a rack for extra brasses. *Yuba Manufacturing Company, Benicia, Cal.*

(Turn to page 90)



PENNSALT CLEANER 35—Soaks away soils—from road grime to baked-on carbon. Dissolves readily in alkali or mineral laden water without scum or sediment.

PENNSALT CLEANER 45-X—An ideal soak cleaner that also is an excellent spray for running gear.

The toughest parts come clean *fast* in this Pennsalt Cleaner soak tank, located in the shops of a major Eastern railroad.

One of these Pennsalt Cleaners will meet 95% of all your shop needs for maintenance cleaning of steel parts

Why stock a dozen types of cleaners when one of these two general purpose Pennsalt Cleaners will give excellent results at lower cost? They meet almost all your shop cleaning needs on steel parts—*and give you important extra advantages.*

Both are powerful, free rinsing, fused alkaline silicates. They have the sustained heavy duty action needed for thorough soak cleaning of diesel locomotive parts. They will do your pre-inspection cleaning, clean your air and oil filters, your cylinder heads and liners—even strip paint. They have low sludging qualities . . . need only occasional recharging.

Your Pennsalt Railroad Maintenance Man will be glad to recommend the right cleaners to meet your needs. You'll be surprised how few are needed for many jobs—how the *right few* increases shop efficiency.

Give your man a call today. Or write: Railroad Maintenance, Pennsylvania Salt Mfg. Co., EAST: Three Penn Center Plaza, Philadelphia 2, Pa., WEST: Woolsey Bldg., 2168 Shattuck Ave., Berkeley 4, Calif.

Favorite of the men in the shops

Pennsalt Chemicals

NEWS

ASME Diamond Jubilee Annual Meeting

Power Show, technical sessions, and inspection trips feature the Diamond Jubilee annual meeting of the American Society of Mechanical Engineers to be held this year in Chicago at the Congress, Conrad Hilton, and Sheraton-Blackstone Hotels from November 13-18. The Chicago Section of ASME will be hosts. A dinner and pageant highlighting ASME milestones from 1880 to the present have been arranged for Tuesday evening, November 15. The annual banquet will be held Thursday evening, November 17. Ceremonies will culminate with the initial presentation of the Elmer A. Sperry Award.

For the Railroad Division the following program has been arranged:

TUESDAY, NOVEMBER 15

Congress Hotel—Florentine Room

2 pm

RAILROAD I

Progress in Railroad Mechanical Engineering 1954 and 1955. (Report)

Adhesion—How Much? By F. G. Fisher, assistant mechanical engineer, Reading, and R. K. Allen, Locomotive and Car Equipment Laboratory, General Electric Company. Discussions by R. L. Wilson, vice-president, Brake Shoe and Castings Division, American Brake Shoe Company, and C. E. Tack, product engineering manager, American Steel Foundries.

Service Testing of Freight Cars, by O. A. Maier, director of research and development, Pullman-Standard Car Manufacturing Company.

WEDNESDAY, NOVEMBER 16

Conrad Hilton Hotel—Parlor B

9 am

RAILROAD II

Symposium on Lightweight, High-Speed Passenger Trains:

History and Development of the ACF Talgo, by J. R. Furrer, manager, Talgo Project, ACF Industries.

Practical Considerations in New Railway Passenger-Car Designs, by A. G. Dean, assistant chief engineer, Railway Division, Budd Company.

Pullman-Standard's New Lightweight Train—"Train X," by T. C. Gray, vice-president, engineering, Pullman-Standard Car Manufacturing Company.

The General Motors Lightweight Train, by B. B. Brownell, chief engineer, Electro-Motive Division, General Motors Corporation, and W. H. Harvey, co-ordinator of new products, Electro-Motive Division.

Remarks by C. K. Steins, mechanical engineer, Pennsylvania.

Shop Building Programs

Erie—The freight-car repair shop to replace the one destroyed by flood waters at Dunmore, Pa., will be in either Hornell, N.Y., or Meadville, Pa. The railroad has suitable property available at both places to build a new shop, which, it is estimated, will cost about $2,000,000. Detailed studies are being made of both locations.

ORDERS AND INQUIRIES FOR EQUIPMENT PLACED SINCE THE CLOSING OF THE OCTOBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Atchison, Topeka & Santa Fe	32[1]	1,750	Road switching	Electro-Motive
	18[1]	1,200	Yard switching	Fairbanks, Morse
Minneapolis, St. Paul & Sault Ste Marie	5[2]	1,750	Road switching	Electro-Motive
New Orleans Public Belt	2	1,200	Switching	Baldwin-Lima-Hamilton
Pennsylvania	16[3]	1,600	Frt. and switching	Alco Products
	5[3]	2,400	Passenger	Alco Products

FREIGHT CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Atchison, Topeka & Santa Fe	500[4]	70-ton gondolas	Pullman-Standard
	500[4]	70-ton gondolas	General American
	300[4]	50-ton box	ACF Industries
	500[4]	50-ton box	Company shops
Bangor & Aroostook	180[5]	Pulpwood	Magor Car
Boston & Maine	1,000[6]	50-ton box	Pullman-Standard
Chesapeake & Ohio	500[7]	70-ton hopper	Company shops
Minneapolis, St. Paul & Sault Ste Marie	500[8]	Box	Company shops
Reading	150[9]	70-ton covered hopper	ACF Industries

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Canadian Pacific	1[10]	(RDC-1) Rail diesel	Budd
	1[10]	Rail diesel (RDC-3)	Budd
Chicago, Burlington & Quincy	4[11]	Siesta coaches	Budd
	5[11]	50-pass. coaches	Budd
	2[11]	Vista Dome coffee-shop-dormitory	Budd
	11[11]	Bedroom	Budd
	2[11]	Vista Dome parlor-observation	Budd
	2[11]	Vista Dome coaches	Budd
	2[11]	Dining	Budd
Missouri Pacific	6[12]	Sleeping	Budd

TRAIN ORDERS

Boston & Maine	See footnote 13	ACF Industries

[1] Deliveries expected to be completed by August 1956.
[2] The Wisconsin Central will receive two of the units in January; the Soo Line, 3 in April.
[3] Scheduled for delivery before January 1.
[4] These cars, plus 100 ore and 100 flat cars previously ordered from company shops and 50 air dump cars ordered from Magor Car, comprise the 2,050 cars the purchase of which had been authorized by the road's board of directors.
[5] Estimated cost, $1,500,000. Delivery expected in spring of 1956.
[6] Authorization to purchase these cars reported in the October issue, page 15.
[7] Estimated cost, $3,600,000. Deliveries expected to start next June.
[8] To be equipped with Nailable Steel flooring. Work to begin next spring.
[9] To cost over $1,300,000. Deliveries expected to begin in March.
[10] These cars are in addition to the three reported in the October issue, page 14.
[11] For completely recquipping "Denver Zephyrs." Each of the two trains, which are expected to enter service between Chicago and Colorado in the fall of 1956, will consist of 11 cars.
[12] Estimated unit cost, $260,000.
[13] Directors of the B&M have authorized the purchase of a Talgo train "of the latest type built by ACF Industries." It is expected the train will be delivered about mid-1956 for service between Boston and Portland, Me. A Talgo demonstration train recently made tests on the B&M.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
July, 1951	2,768,920	8,886	18,823	27,709	99,929
July, 1952	2,575,299	10,566	15,833	26,399	97,553
1953					
July	2,925,317	9,342	15,775	25,117	116,467
August	2,971,020	8,638	14,160	22,798	150,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,833	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,282
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,786
September	2,614,432	6,740	8,882	15,622	167,356
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813

Shop Programs

(Continued from Page 14)

New York Central—The NYC has consolidated its car-building and car-repair work for its lines East in the Despatch Shops, Inc., at Rochester, N. Y. The Central's car shops at Buffalo have been closed and their work transferred to Rochester. Despatch Shops, a wholly owned subsidiary of the road, is leasing its plant and facilities to the New York Central and is being operated as the road's East Rochester shops. No expansion of the East Rochester facility is planned now, but equipment that can be used there is being moved from Buffalo. The consolidation anticipates full scale operations at Rochester over a 12-month period, the road indicated. Economies are expected to be substantial.

St. Louis-San Francisco—Construction of a new car rebuilding shop at Springfield, Mo., has been authorized, at an estimated cost of $710,000.

Miscellaneous Publications

"THE RAILROAD DYNAMOMETER CAR OF THE UNIVERSITY OF ILLINOIS AND THE ILLINOIS CENTRAL RAILROAD." By Prof. John K. Tuthill (dec.). Bulletin contains a brief history of the development of this type of test equipment, and diagrams and illustrations of the present car used both for research and for training students. Though designed for use with steam locomotives, much information of value with any kind of power is given, and equipment could be installed to study diesel locomotives. Free. *Engineering Experiment Station, University of Illinois, Urbana, Ill.*

SELECTIVE MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of July 1955	Month of July 1954	7 months ended with July 1955	7 months ended with July 1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	5,739	5,998	36,389	44,213
3-06	Total, Diesel-electric	35,998	33,003	243,489	223,516
3-07	Total, electric	747	630	5,103	4,501
3-04	Total, locomotive-miles	42,720	39,826	286,464	273,016
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,681	1,481	11,383	10,350
4-06	Empty, total	927	912	6,327	6,180
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	13,195	12,132	84,040	87,036
6-02	Total in oil-burning steam locomotive trains	2,850	2,378	12,866	15,436
6-03	Total in Diesel-electric locomotive trains	101,015	89,976	686,348	615,572
6-04	Total in electric locomotive trains	2,265	1,891	15,636	13,824
6-06	Total in all trains	120,082	106,988	803,859	734,575
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.02	1.02	1.02
10-02	Loaded freight car-miles	42.3	39.8	42.6	40.6
10-03	Empty freight car-miles	23.4	24.5	23.7	24.0
10-04	Total freight car-miles (excluding caboose)	65.7	64.3	66.3	64.6
10-05	Gross ton-miles (excluding locomotives and tender)	3,028	2,875	3,011	2,881
10-06	Net ton-miles	1,373	1,257	1,355	1,268
12	Net ton-miles per loaded car-mile (M-211)	32.4	31.6	31.8	31.2
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	64.4	61.9	64.3	62.8
14	Averages per train hour (M-211):				
14-01	Train miles	18.6	18.8	18.8	18.8
14-02	Gross ton-miles (excluding locomotive and tender)	55,522	53,354	56,000	53,739
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.6	42.0	46.2	42.1
14-02	All	44.2	39.5	43.5	39.8
15	Average net ton-miles per freight car-day (M-240)	922	772	889	781
17	Per cent of home cars of total freight cars on the line (M-240)	42.9	53.0	47.6	54.0

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	1,513	2,315	9,942	16,909
3-06	Diesel-electric	21,075	21,662	142,074	145,828
3-07	Electric	1,307	1,407	9,223	9,794
3-04	Total	23,896	25,385	161,246	172,531
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	251,157	257,171	1,642,824	1,726,606
4-09	Total in coal-burning steam locomotive trains	8,434	10,399	56,289	83,213
4-10	Total in oil-burning steam locomotive trains	5,357	10,521	29,200	61,600
4-11	Total in Diesel-electric locomotive trains	222,650	221,122	1,451,643	1,473,153
12	Total car-miles per train-miles	10.11	9.77	9.80	9.64

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	294,118	296,166	1,893,856	2,219,777
1-02	Steam-oil-burning	53,548	54,939	322,025	378,366
1-03	Diesel-electric[1]	3,651,190	3,293,693	24,560,574	22,804,695
1-06	Total	4,005,102	3,652,422	26,822,324	25,467,880
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	7,339	11,201	61,645	88,008
2-02	Steam, oil-burning	4,135	5,680	34,369	32,269
2-03	Diesel-electric[1]	249,661	258,571	1,708,602	1,786,399
2-06	Total	287,210	300,515	1,984,208	2,091,109
3	Hours per yard locomotive-day:				
3-01	Steam	5.9	4.7	5.3	4.8
3-02	Diesel-electric	15.5	14.7	15.4	15.0
3-05	Serviceable	15.1	14.2	15 1	14.3
3-06	All locomotives (serviceable, unserviceable and stored)	13.6	12.2	13.3	12.3
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.65	1.72	1.63	1.71
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.71	.72	.75	.75

[1]Excludes B and trailing A units.

PERSONAL MENTION

Atlantic Coast Line

D. B. LACY, assistant superintendent motive power, Southern division at Waycross, Ga., appointed superintendent motive power of the division.

Canadian Pacific

GREGOR GRANT, district master mechanic at Calgary, Alta., retired.

R. C. THOM, division master mechanic at Winnipeg, Man., appointed district master mechanic at Calgary, Alta.

B. B. WOODLAND, general inspector of diesel equipment at Winnipeg, appointed division master mechanic at Winnipeg.

S. A. JONES appointed general inspector of diesel equipment at Winnipeg.

D. F. SHAW appointed district diesel inspector at Calgary, Alta.

Chesapeake & Ohio

Appointed car lubrication inspectors: C. C. DOANE at Grand Rapids, Mich.; RICHARD GARDULL at Saginaw, Mich.; A. M. CHILDERS at Huntington, W. Va.; F. J. LYLE at Richmond, Va.

Chicago, Rock Island & Pacific

L. C. BOWES, electrical engineer at Chicago, has retired.

ROBERT F. NEWTON appointed electrical engineer at Chicago. Formerly assistant superintendent, electric operations, Great Northern.

Erie

MICHAEL J. FEDORKA, general foreman and wreckmaster at Susquehanna, Pa., appointed division car foreman at Jersey City, N. J.

Maine Central

ROY E. BAKER, general manager—mechanical at Portland, Me., appointed general manager.

Missouri Pacific

G. W. NIEMEYER, road master mechanic, appointed acting terminal master mechanic. Headquarters, North Little Rock, Ark.

H. E. JAMISON appointed acting road master mechanic. Headquarters, North Little Rock, Ark.

New York Central

F. L. HOFFMAN appointed master mechanic at Harmon, N. Y.

R. J. PARSONS appointed assistant master mechanic at East Syracuse, N. Y.

Norfolk & Western

H. G. GILLESPIE, JR., appointed mechanical inspector, office of general superintendent motive power.

HOWARD L. DAVIS, gang leader at Williamson shop, appointed gang foreman.

(Continued on page 18)

FREE ANALYSIS OF YOUR CAR LUMBER PROBLEMS!

Let us analyze your lumber problems and then discuss with you the savings that can be effected by using Koppers Pressure-Treated Car Lumber on your railroad. No obligation is incurred.

Get a 10-year free ride with

Koppers Pressure-Treated Car Lumber

What happens when two new flatcars start out in life together—one with *untreated* wood members, and the other with *pressure-treated* wood members?

In five years, according to railroad records, the untreated car will usually be sidetracked for costly repairs to the lumber.

On the other hand, the car using *treated* lumber will just be "getting warmed up" when it reaches the same five-year mark. Seventeen months later, it will be at the break-even point. In other words, these extra months of service will have paid for the somewhat higher original cost of the pressure-treated lumber.

From then on it's all gravy!

From then on—in fact for the next ten years or more*—you get a "free ride" in respect to maintenance costs and out-of-service losses caused by decay damage. These revenue-cutting items are *eliminated* by constructing or repairing cars with Koppers Pressure-Treated Lumber.

**Seventeen years is the average service life for Pressure-Treated Car Lumber.*

KOPPERS COMPANY, INC.

Wood Preserving Division, Pittsburgh 19, Pennsylvania

KOPPERS

PRESSURE-TREATED CAR LUMBER

PERSONAL MENTION *(Continued from page 15)*

Pennsylvania Reorganization

The Pennsylvania's former three regions and 18 divisions, as of November 1, have been replaced by nine newly constituted regions.

Each regional manager is responsible for production and sales and promotion of transportation, as well as industrial development in the area served. They will report to a system vice-president on matters affecting other regions, or the railroad as a whole. Under this vice-president is a vice-president in charge of transportation and maintenance, with system-wide responsibility.

On the president's staff is a vice-president in charge of freight traffic; another in charge of passenger traffic; a third in charge of research and development, and a fourth in charge of personnel.

Formerly the general superintendent of transportation, general superintendent of motive power and chief engineer-maintenance of way on the regions worked *through* division superintendents to trainmasters, master mechanics, and division engineers. The new officers are in direct charge of field operations. Trainmasters, road foremen of engines, master mechanics and district engineers located at various points on each region comprise their forces.

The organization of the general manager-transportation, set up on the new basis in June, has the basic goal of centralizing system control over equipment allocation and train movement. He is also a member of the system car committee charged with development of equipment needs and design.

A new officer and new top department is a vice-president-research and development. He will handle long-term research, such as the effect of atomic energy, growth and decline of territories, competitive developments and public aids and burdens. He will also coordinate studies and tests by other departments of new physical developments, like lightweight trains, trailers-on-flats, electrification and yard layout.

Following are the names and titles of officers and others as they relate to mechanical and electrical functions:

SYSTEM OFFICERS

Reporting to System Vice-president J. P. Newell, Philadelphia:

Vice-president transportation and maintenance: A. J. Greenough
Assistant vice-president—chief mechanical officer: H. T. Cover
Assistant chief mechanical officer: W. O. Teufel
Assistant chief mechanical officer—car: H. M. Wood
Manager—heavy repair shops: C. I. Clugh
Mechanical engineer: H. L. Decker
Electrical engineer: J. Stair, Jr.
Engineer—tests (Altoona): M. A. Pinney
Manager—methods and cost control— J. L. Parker
Supervisor—equipment expenditures: C. H. Bowers
Superintendent—floating equipment: J. N. Abbott
Supervisor—MCB clearing house: T. J. Boring

NEW YORK REGION

Reporting to Regional Manager P. M. Rocper, New York:

Assistant regional manager: N. L. Fleckenstine
Superintendent—equipment: G. S. Webb
Supervisor—car equipment: A. P. G. Schlegal
Supervisor—methods and cost control: W. P. Bickley
Master mechanic (Newark): R. M. Holcombe
Master mechanic (New York): R. C. Johnston

PHILADELPHIA REGION

Reporting to Regional Manager G. C. Vaughan, Philadelphia:

Assistant regional manager: H. D. Kruggel
Superintendent—equipment: H. H. Haupt
Supervisor—car equipment: P. B. Cole
Supervisor—methods and cost control: C. R. Johnson
Supervisor—diesel equipment: T. L. Preun
Master mechanic (Harrisburg): L. A. Dixon
Master mechanic (Philadelphia): J. C. White

CHESAPEAKE REGION

Reporting to Regional Manager J. A. Schwab, Baltimore:

Assistant regional manager: V. H. McLean
Superintendent—equipment: J. S. Bell
Supervisor—car equipment: C. W. Garmon
Supervisor—methods and cost control: C. S. Kifer
Supervisor—diesel equipment: D. R. Knoff
Master mechanic (Wilmington): T. J. Sheridan
Master mechanic (Baltimore): R. E. Pinkham

NORTHERN REGION

Reporting to Regional Manager P. W. Neff, Buffalo:

Superintendent—transportation: E. P. Adams
Superintendent—equipment: E. C. Hanly
Supervisor—car equipment: J. K. Sherwood
Supervisor—methods and cost control: N. L. Butters
Supervisor—diesel equipment: M. J. Mitchell
Master mechanic (Williamsport): C. A. Korn, Jr.
Master mechanic (Buffalo): P. E. Geise

PITTSBURGH REGION

Reporting to Vice-president and Regional Manager M. S. Smith, Pittsburgh:

Assistant regional manager: H. H. Vaughn
Superintendent—equipment: H. C. Wright
Supervisor—car equipment: W. B. Moir
Supervisor—methods and cost control: R. J. Conrad
Supervisor—diesel equipment: F. C. Conte
Master mechanic (Pittsburgh): D. B. Owens
Master mechanic (Pitcairn): W. H. Yarber
Master mechanic (East Altoona): S. W Shirley, Jr

LAKE REGION

Reporting to Regional Manager H. M. Phillips, Cleveland:

Assistant regional manager: E. L. Hofmann
Superintendent—equipment: W. J. Fulton
Supervisor—car equipment: J. A. Brimner
Supervisor—methods and cost Control: E. Windisch
Supervisor—diesel equipment: K. E. Burns
Master mechanic (Cleveland): W. H. Long
Master mechanic (Canton): D. M. Peck

BUCKEYE REGION

Reporting to Regional Manager A. M. Harris, Cincinnati:

Superintendent—equipment: J. P. Francis
Supervisor—car equipment: J. M. McGuigan
Supervisor—methods and cost control: G. L. Winnegar
Supervisor—diesel equipment: B. L. Hartley
Master mechanic (Cincinnati): P. I. Harclerode
Master mechanic (Columbus): H. S. Miller

SOUTHWESTERN REGION

Reporting to Regional Manager C. G. Magruder, Indianapolis:

Superintendent—equipment: R. R. McKinney
Assistant superintendent—equipment J. M. Carpenter
Supervisor—car equipment: H. T. Bramblett
Supervisor—diesel equipment: W. S. Adams

NORTHWESTERN REGION

Reporting to Vice-president and Regional Manager H. H. Pevler, Chicago:

Assistant regional manager: J. D. Fuchs
Superintendent—equipment: C. W. Whistler
Supervisor—car equipment: S: Nagy
Supervisor—methods and cost control: P. Thomas
Supervisor—diesel equipment: O. F. Opatz
Master mechanic (Chicago): P. G. Jamison
Master mechanic (Fort Wayne): L. E. J. Garrett

SUPPLY TRADE NOTES . . . . . .

AMERICAN BRAKE SHOE COMPANY. BRAKE SHOE AND CASTINGS DIVISION.—*Joseph H. Parsons*, vice-president, has retired. SOUTHERN WHEEL DIVISION.—"The First 5,000,000 Miles" is the title of a new sound/color motion picture describing the company's new "heavy duty" cast-steel wheel. The picture, produced for railroad audiences, tells the story of a multi-million dollar research program begun 14 years ago at the company's research center in Mahwah, N. J., and then shows the step-by-step manufacturing process used at the new Southern Wheel division plant at Calera, Ala. The plant has a capacity of 400 wheels a day.

■

INTERNATIONAL NICKEL COMPANY.—Headquarters of the central Atlantic coast technical field section of International Nickel development and research division

have been moved to 1150 York road, Abington, Pa., from 67 Wall street, New York.

■

TORMAN COMPANY. — The Torman Company, Chicago, has announced appointment of *Glenn Sudderth & Assoc.*, 423 Collier Road N.W., Atlanta, Ga. as southeastern representative for sale of Torman electrical equipment for diesel locomotives.

■

S. J. Fraenkel

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY—*Stephen J. Fraenkel*, has been appointed research and development director. He was formerly manager of the propulsion and structural research department of Armour Research Foundation.

■

W. C. Taylor

AMERICAN STEEL FOUNDRIES—*William C. Taylor*, district sales manager at Chicago, has been appointed vice-president, sales, transportation equipment division, in charge of the New York office. He succeeds *Edward M. Van Winkle*, resigned.

■

MAGNUS METAL DIVISION, NATIONAL LEAD COMPANY.—*John P. Borda* has been appointed general manager at New York, succeeding *William V. Burley*, who has retired.

■

MAGNUS METAL CORPORATION.—*Edward M. Van Winkle* has been appointed president, with headquarters at New York, succeeding *William V. Burley*, retired.

WESTINGHOUSE AIR BRAKE COMPANY.—*C. F. Hammer* has been appointed assistant director of engineering, Air Brake Division, at Wilmerding, Pa.

■

TIMKEN ROLLER BEARING COMPANY.—*Ralph W. Updegraff*, chief industrial engineer, Bearing Division, has been appointed chief industrial engineer of the company. *E. H. Hughes*, manager of the sales order department of the company, has been named to the newly created post of assistant to the sales director.

■

NATIONAL CARBON COMPANY. DIVISION OF UNION CARBIDE & CARBON CORP.—*Dr. Clarence E. Larson* has been appointed vice-president in charge of research. *Dr. L. M. Currie*, formerly vice-president in charge of research, continues as vice-president, assuming responsibilities involving sales, production, development and research.

■

GARLOCK PACKING COMPANY.—*Robert M. Waples*, executive vice-president, has been elected president, succeeding *Geo. L. Abbott*, who has been elected chairman of the board and chief executive officer.

■

MINNESOTA MINING & MANUFACTURING CO.—*Bertrand Y. Auger*

(Continued on page 87)

C-D-F TAPES of TEFLON*

- **Heat Resistant—up to 500° F.**
- **High Dielectric Strength**
- **Strong, tough, durable**

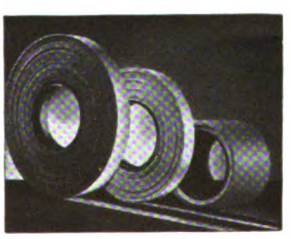
It is no longer necessary to spend time, effort and materials in frequent rewrapping of field coils. Use C-D-F TEFLON tapes for the job—they have unusually long service life. Tapes are easy to apply, easy to handle. Rolls are supplied in a wide range of widths and thicknesses either in 100% TEFLON film or TEFLON glass fabric supported.

TEFLON has high heat resistance—withstands 260° C. (or 500° F.) without appreciably affecting its physical or electrical properties. It meets Class H AIEE standards for maximum hot spot insulation temperature of 180° C. TEFLON has practically zero water absorption and its electrical properties are little affected after long exposure to high humidity. Its dissipation factor and dielectric constant are extremely low and unchanged over a wide range of frequencies.

TEFLON has a wide range of applications in the railroad industry. For wire and cable coverings where the electrical properties must not suffer impairment even under extreme temperature and humidity conditions, TEFLON is the ideal material. TEFLON may be applied in single or multiple wrapping operations which may include a TEFLON glass fabric cloth supported tape on the outside for resistance to abrasion. TEFLON wrapped cables find extensive use in Diesel locomotive wiring where abrasion of exposed wiring, due to undercar blast, is an important factor.

If you are not now using C-D-F TEFLON tapes and want to know more about TEFLON, the most promising of new plastics, write for Folder T-52 with samples. For technical assistance call your C-D-F sales engineer (offices in principal cities). He's a good man to know.

*du Pont Trade Mark

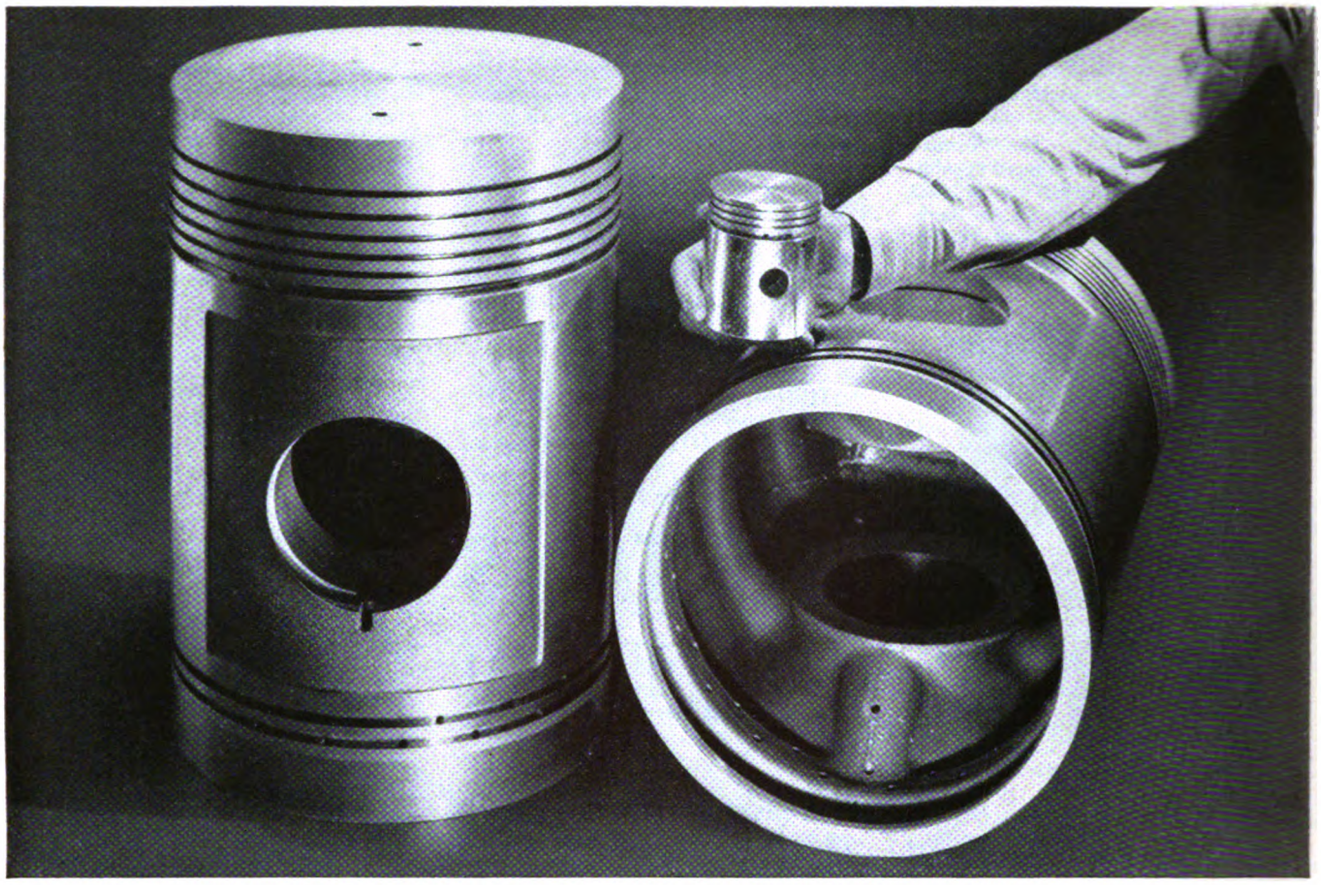


CDF

Continental-Diamond Fibre

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 104, DELAWARE



Versatility . . . Light Weight . . . High Heat Conductivity!

PISTONS OF ALCOA ALUMINUM HAVE ALL THREE!

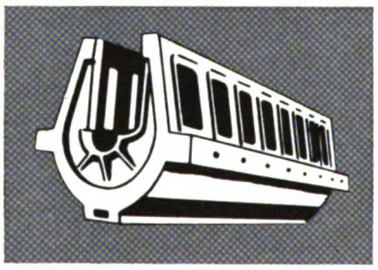
Only Alcoa produces all three types of pistons —permanent-mold, semipermanent-mold, and forged. Sizes of Alcoa® Pistons range from the smallest to 21" in diameter, and they may be ordered with or without inserts for added ring groove life.

Alcoa Aluminum Pistons weigh less—making possible increased engine speeds and resulting in increased horsepower.

Aluminum's high heat conductivity lowers surface temperatures and allows greater engine output without increasing operating temperatures. To get the complete story on *all* Alcoa Aluminum products for the diesel industry, write: Aluminum Company of America, 1986-L Alcoa Building, Pittsburgh 19, Pa.

NEW TYPE OF PISTONS FOR FUTURE ENGINE DESIGNS

For diesel manufacturers who now have engines in the design stage, Alcoa's research and development teams have produced new types of aluminum pistons which embody many highly desirable features. While they are not yet in full production, Alcoa is ready to talk to manufacturers of high output engines—and to discuss the possibilities of *greater power from the same size engine!*

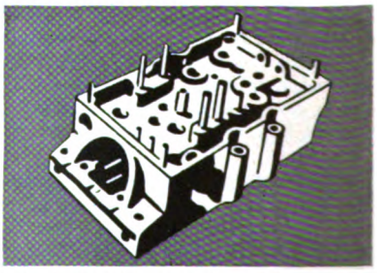


CRANKCASES AND FRAMES of lightweight Alcoa Aluminum give diesels higher horsepower-to-weight ratios, increase efficiency in operation.

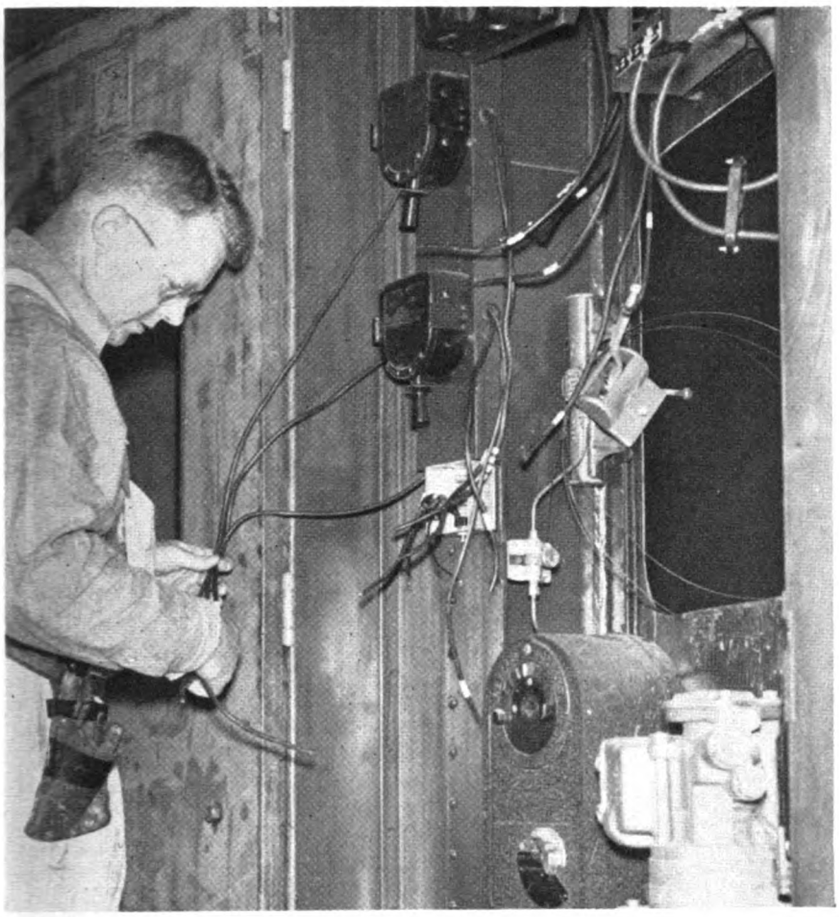
SUPERCHARGING AND SCAVENGING are more efficient through the use of aluminum. Here, too, diesels can save weight through the use of aluminum.

Your Guide to Aluminum Value

ALCOA® ALUMINUM
ALUMINUM COMPANY OF AMERICA



CYLINDER HEADS of Alcoa Aluminum distribute heat better, allow increased engine ratings. They also mean lighter weight, easier servicing.



Electrician wiring motorman's cab control station on new M. U. car with Simplex Car Wire.

285 Multiple-Unit Cars Equipped with Simplex Car Wire

Simplex Car Wire is used to wire air-conditioning units, lights, and control equipment in 285 new, multiple-unit, passenger cars for several railroads.

The rubber insulation on Simplex Car Wire won't lose physical and electrical properties when soaked in water or exposed to heat.

A smooth, tough, neoprene jacket on Simplex Car Wire resists abrasion, acids and oil.

Simplex Car Wire strips readily for terminating. It's flexible and easy to handle.

It resists oxidation and withstands vibration.

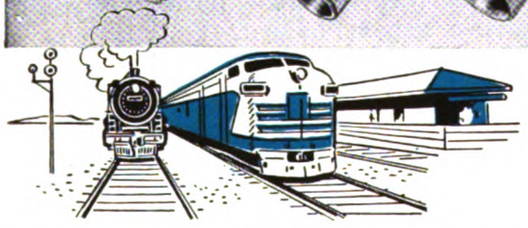
Write the Railroad Department at the address below for more details about Simplex Car Wire.

Simplex CAR WIRE

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

HARDENED and GROUND for LONGER wear

EX-CELL-O PINS AND BUSHINGS



Keep your equipment out of the shop and on the rails with Ex-Cell-O steel pins and bushings. They give from four to six times longer service than ordinary pins and bushings. The tough ductile core of Ex-Cell-O pins and bushings withstands shocks, vibration; their hard case and fine finish resist abrasive action.

52-2

Standard styles and sizes of Ex-Cell-O pins and bushings for steam, Diesel, and passenger car equipment are given in the new Ex-Cell-O Bulletin 32428. Write today for your copy.

RAILROAD DIVISION

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

STATEMENT required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) showing the ownership, management, and circulation of Railway Locomotives and Cars, published monthly at Philadelphia, Penna., for November, 1955.

1. The names and addresses of the publisher, eidtor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Corporation, 30 Church Street, New York 7, N.Y.

Editor, H. C. Wilcox, 30 Church Street, New York 7, N.Y.

Western editor, G. J. Weihofen, 79 Monroe St., Chicago 3, Ill.

Business manager, C. W. Merriken, Jr., 30 Church Street, New York 7, N.Y.

2. The owners are: Simmons-Boardman Publishing Corp., 30 Church St., New York 7, N.Y. Stockholders of one percent or more, James G. and Louise Lyne, 30 Church St., New York 7, N.Y.; Arthur J. McGinnis, 30 Church St., New York 7, N.Y.; Joseph S. and Clarice Crane, 30 Church St., New York 7, N.Y.; Frederick A. and Artimese B. Clark, 30 Church St., New York 7, N. Y.; Samuel O. and Carrie E. Dunn, 79 West Monroe St., Chicago 3, Ill.; Edward G. & Elizabeth Gavin, 79 West Monroe St., Chicago 3, Ill.; Joseph or Katherine Sanders, 2909 Maple Ave., Dallas 4, Texas; John R. Thompson and Kathe Thompson, 79 West Monroe St., Chicago 3, Ill.; Mae E. Howson, 6922 Paxton Ave., Chicago, Ill.; Ella L. Mills and Catherine S. Mills, Westfield, N.J.; Ruth Wheaton Johnson, 1615 Ravenna Blvd., Seattle 5, Wash.; William E. Russell as Trustee L/W/T or Ida R. Simmons F/B/O; Mrs. E. S. Fenton, c/o Russell and Russell, 41 East 42nd St., New York 17, N.Y.; J. Streicher & Co., 2 Rector St., New York, N.Y. Partners of J Streicher & Co. are: Joseph Streicher, Jack L. Streicher, Ethel Streicher, Judson Streicher all of 2 Rector St., New York, N.Y.; J. V. McManus, 39 Broadway, New York, N.Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or other security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

H. C. WILCOX,
Editor

Sworn to and subscribed before me this 22nd day of September, 1955.

EDMUND J. PUYDAK
Notary Public, State of New York No. 41-3179300
Qualified in Queens County
Certs. filed with New York Co. Clk. & Reg.

[SEAL] (My commission expires March 30, 1957)

EDITORIALS

Looking Back on a Meeting

Since 1939 the Coordinated Mechanical Associations have come a long way. The increases in membership since that time are not just an evidence of progress and success but are, above all, tangible evidence of the value of the associations to the railway industry and the continually increasing interest both in the meetings and the exhibits. There have been those who have suggested that, from many standpoints, these meetings in Chicago are now the prime mechanical meetings of the American railroad industry. Be that as it may; time will tell.

It is always well to re-state purposes, functions and objectives. No one should forget that these Coordinated Mechanical Associations are concerned primarily with the problems of maintenance and servicing of locomotives and cars. Their *only* relation to equipment design and standards is the privilege of recommending changes that will simplify and reduce the cost of equipment maintenance. The AAR Mechanical Division has the sole responsibility for adopting standards and administering the application thereof. Thanks to watchful executive committees the coordinated groups have rarely wandered far outside of their own jurisdictions. They can deal with physical problems; they can deal with organization problems as they relate to maintenance but a word of caution might be worth while at this time with respect to problems relating to organized labor, whether discussions deal with the rank and file or supervisory personnel. Such subjects or discussion do not belong in these programs.

It may also be time for these groups to consider the advisability of bringing together the vast amount of information developed over the last 10 or 15 years into some form of permanent record, such as a manual, so that anyone can find, in one place, any of the data that are needed in everyday maintenance operations. Each of the four associations should appoint a committee to explore the desirability of bringing into being a record of the findings of the many committees of the Air Brake, Car Officers', Locomotive Maintenance Officers, and the Fuel Associations that have had far reaching influence on today's maintenance practices and facilities and could serve as a guide to the future.

The 1955 meeting, like the others, was a success.

Suppliers and the Railway Progress Institute

Manufacturers who supply railroads have for years been subjected to railroad criticism because of lack of support for railroad public relations objectives. There is no longer any lack of definition as to what railroads want—and what they need if they are going to look forward to a prosperous future. There is no longer any good reason why the supply industry should not become just as active as railroads in advancing these objectives. Recently a forward step has been taken.

Railway supply leaders have provided the machinery for engaging in increased educational effort on the railroads' behalf—the Railway Progress Institute. A relatively inactive Railway Business Association has been reorganized as the RPI because of the deep interest some railway suppliers have in giving support to the legitimate objectives of the railroads. Holcombe Parkes, one of the country's top professionals in the field of public relations has been chosen as president. Mr. Parkes has a railroad background and knows the problem from the inside as well as without.

The main task confronting the RPI now is explaining to suppliers about their more active program which requires increased dues. Leaders in the railroad industry are strongly in favor of this increased activity. The selfish interests of suppliers are aided by improving the competitive position of the railroads. The railroad industry would be a better customer if the railroads had a freer hand in making competitive rates, and if their competitors were paying more nearly compensatory charges for the use of government property. The assignment of a small part of supply industry revenues to public education about the railway problem does not come under the heading of charity but rather under "enlightened self interest."

MORE CARS for your money

plus a BIGGER RETURN per dollar of car investment

...with LOW-COST SOLID BEARINGS

When you buy new freight cars, you want the maximum in car availability and income-producing potential. Here's why you get it with solid bearing freight cars:

1st You can buy up to 10% more solid bearing cars for the same money. That means an extra 100 income-producing cars for each 1000-car investment.

2nd The 100 extra solid bearing cars will yield additional net revenue of from $250,000 to $400,000 per year — income that would be *lost* if any other type of high-cost bearings were applied*.

3rd Suppose you don't *need* the extra 100 cars. Then you reduce your initial investment by approximately 10% and get the same increase in return *per dollar* represented by the $250,000 to $400,000 above.

Analyze the performance of solid bearings and you find that the average car has *only one set-off for bearing difficulties every 12 years* — even though this average car is almost 20 years old! You can bet that cars with high-cost journal bearing assemblies will have a tough time beating this record.

What's more, there are low-cost ways to improve solid bearing performance even further — cut maintenance and operating costs, too — and still keep the same big advantages of low initial investment and high earning power. Write us for complete information. Magnus Metal Corporation, 111 Broadway, New York 6; or 80 East Jackson Blvd., Chicago 4.

MAGNUS
Solid Bearings

* *Based on analysis of independent study of solid-bearing operating costs. Copies of analysis on request.*

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

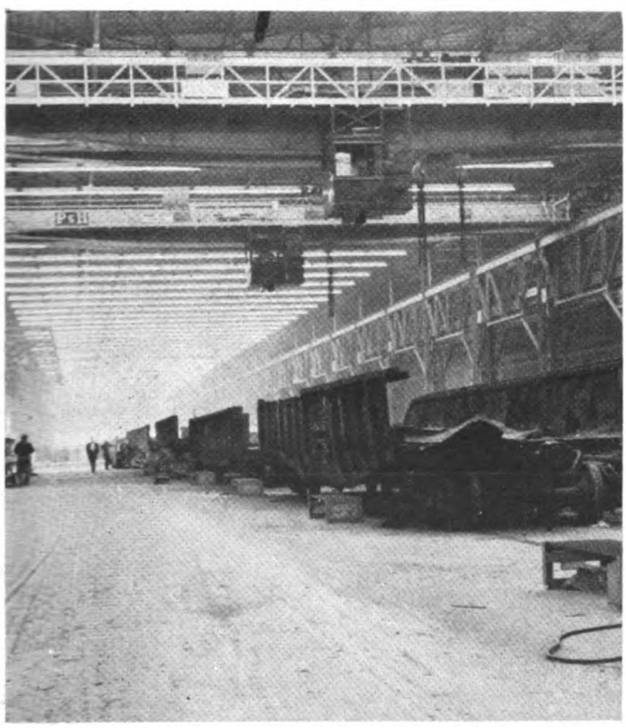
Pennsylvania Building Production Line Car Shop

Samuel Rea Car Repair Shop is being tooled for 50 heavy freight car repairs daily and has cost $12,000,000.

Flexibility, ample space, and high capacity are all features that have been included in the Samuel Rea Car Repair Shop now nearly completed at Hollidaysburg, Pa. Already the Pennsylvania is getting cars out of its new $12,000,000 plant. When the three production lines are in operation, there will be an output of fifty cars daily. The shop is being tooled to make heavy repairs on any type of freight car and the Pennsylvania has about 180,000 of them—the largest fleet in the country. To repair these cars they have built what is claimed to be the largest shop under one roof.

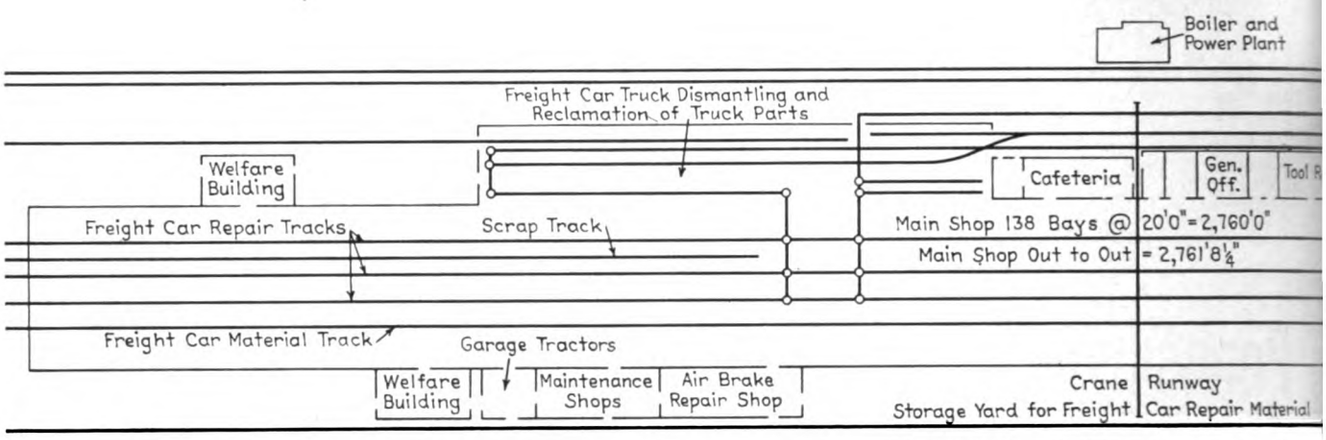
Hollidaysburg is ten miles south of Altoona, long the center of Pennsy mechanical department operations. Freight car repairs are being moved from Altoona to Hollidaysburg, and eventually Altoona Works will only rebuild locomotives and passenger cars. The building of new freight cars and the fabrication of freight car parts will continue at Altoona.

The site at Hollidaysburg is located on a PRR line that parallels the main line but by-passes the Horseshoe Curve and Altoona. Today there is little through movement over this route except when the main line cannot be used. In the past, this by-pass was regularly used



The 700,000 sq ft of Rea shop has illumination intensity of 35 ft candles produced with nearly 25 mi of fluorescent fixtures. Cars shown are being repaired in the shop prior to establishment of production lines.

Sheltered unloading platforms in front of modern warehouses, and a large outside storage area serviced with overhead cranes serve the stores department facilities which will expedite materials handling and stocking.



The 2760 ft length of this shop when tooled for production line repairs will see cars mov-

by some through freights, and Hollidaysburg had a hump classification yard and a large locomotive terminal. All this ended years ago, and the Hollidaysburg facilities were either abandoned or used only for storage.

Weatherproof Production Line

In 1949 studies were started with the aim of weatherproofing Pennsy car repairs. It was known that it was worth-while to get as much of this work as possible under roof and no longer subject to interruptions caused by rain and cold weather. At the same time, it was decided that a production line might be established if there were facilities for accumulating sufficient cars of the same type. Successful production-line repair requires steady flow.

The site at Hollidaysburg was selected because in the former classification yard was sufficient area for the huge plant that was planned. Part of this yard would provide the track space for accumulating cars in sufficient numbers to justify production-line repairs. A minimum of grading was required. Finally, the proximity of the Altoona shops and the reclamation plant permitted integrating all these operations with the Samuel Rea Shop.

Construction of the new car shop was authorized in June, 1952 and work began in October, 1952, when the removal of the hump was started. The summer of 1955 saw the first car turned out. Late fall sees the starting of two of the production lines. During 1956 the shop should be approaching its rated output.

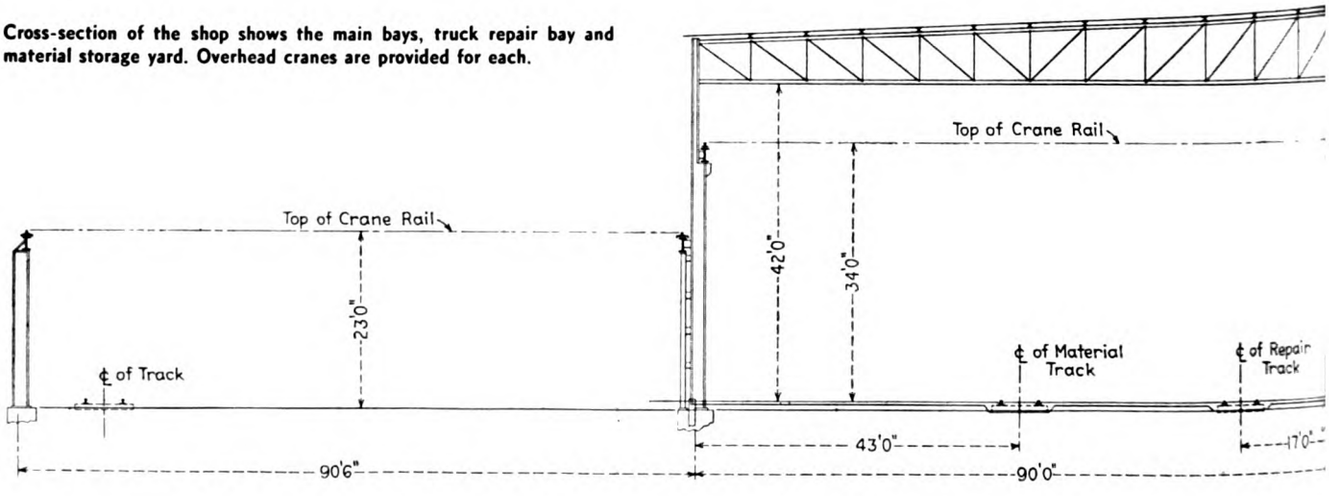
"Largest Under One Roof"

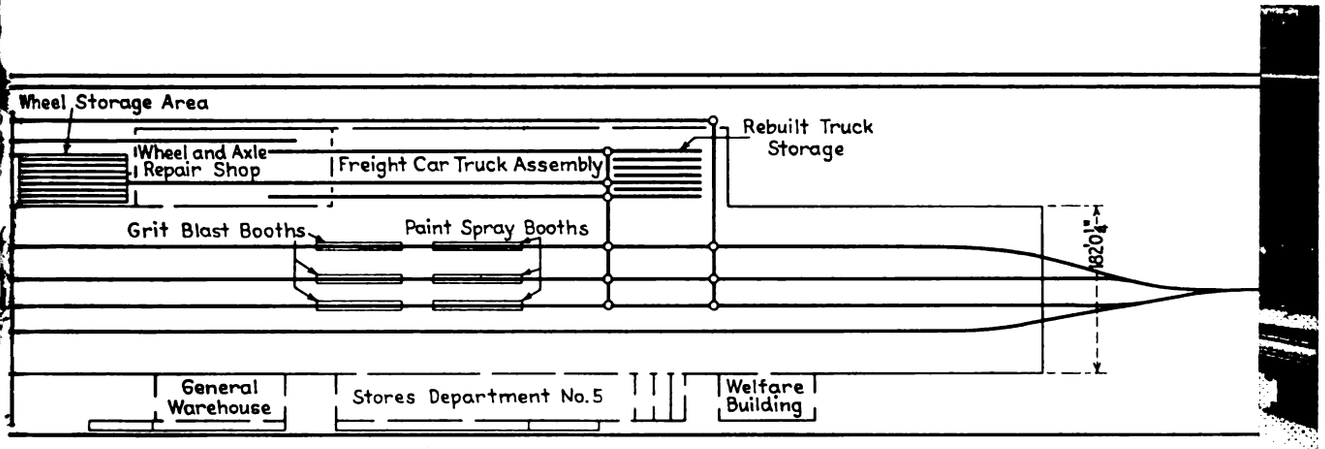
The "largest car repair operation under one roof" is the way the Pennsy describes the Samuel Rea Shop. There are about three miles of railroad track installed under the 704,472 sq ft of roof. The main shop is over 2,760 ft long and has a width of 180 ft. Along the north side are two large bays used for truck and wheel work. The main shop and these two truck bays are floored throughout with 6 in. of concrete.

Shop offices, tool room, cafeteria and locker rooms are also built along the north wall. Much of the south side of the building is occupied with stores department facilities. These are two warehouse buildings covering over 30,000 sq ft and equipped with covered unloading docks. There is also an outside storage area about 800 ft long served by two overhead cranes. The south side of the main shop has maintenance bays and a garage for storing and maintaining the material-handling truck equipment which will service the shop. Additional locker rooms and an air brake repair bay are also located here.

East of the shop is a scale for light-weighing the cars after they are rebuilt. This scale was formerly part of the

Cross-section of the shop shows the main bays, truck repair bay and material storage yard. Overhead cranes are provided for each.





ing from west to east—left to right in this floor plan. Entire operation will be under roof.

equipment of the Hollidaysburg classification yard. It was renovated and lengthened before being installed at the Rea shop. North of the shop building is a service building containing two 500 hp oil (or gas) fired boilers, and two 3,000 cfm synchronous-motor driven air compressors. Locker rooms, offices, cafeteria and some smaller work areas will be heated with steam-fed space heaters. The boiler plant will also heat wash water for the locker rooms. The main repair areas of the shop will not be heated.

An acetylene plant and an oxygen supply unit are being installed near the shop and will be operated by outside vendors. Natural gas and electricity are purchased from local utility companies, and water is procured from a PRR subsidiary. Sewage disposal is handled by the borough of Hollidaysburg.

Car Repair Operations

Production lines will be operated over three tracks that run the full 2,760 ft length of the building. A fourth full-length track at the south side has been designated for material handling, but could be used for production if the need arose. Maximum flexibility has been built into the three present production-line tracks which can be tooled to make repairs on any type of freight car. It is possible

ro bays
en into
to and
that all three lines may be repairing the sam
at the same time. It is equally probable t
might be doing a different type of car. Alo
length of the tracks are key-slots in the c tracks.
They will be used for erecting PRR-desig ng up
scaffolding. This can be set up and dism day's
production picture changes.

Service boxes are provided on each side
on 40-ft centers through the shop. This pe
of short hoses, short welding cables, and a part
lines. It leaves the shop floors open for t f the
of material trucks. op re-

While there is a maximum of flexibility i widely
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of hopper car parts. Because of their specia d for
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Truck Repairs

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they are transferred from their own trucks
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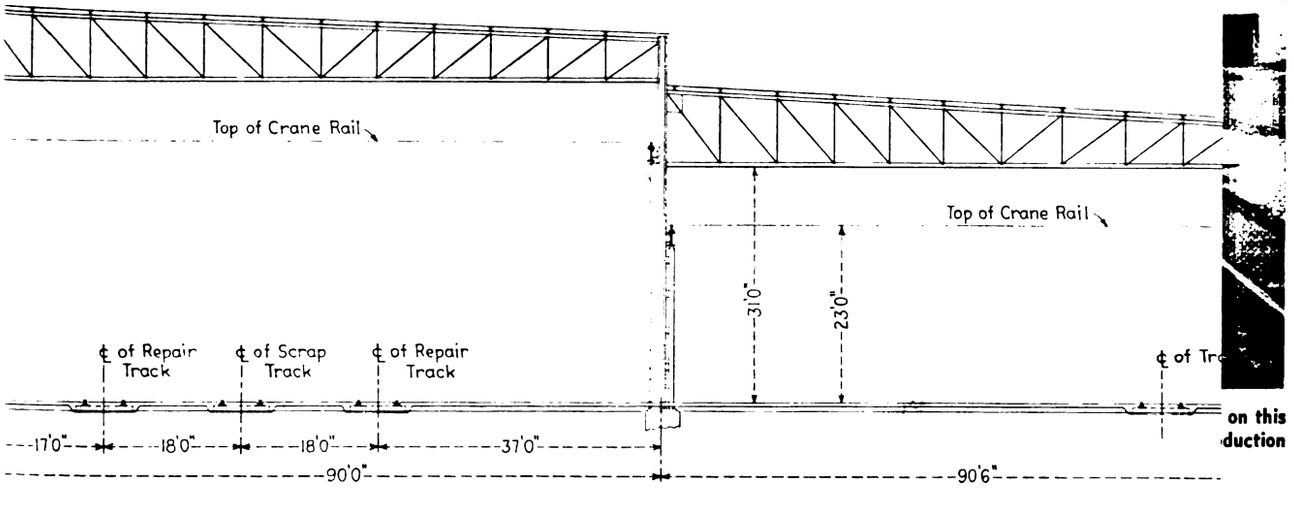
the truck areas for dismantling. Wheels are



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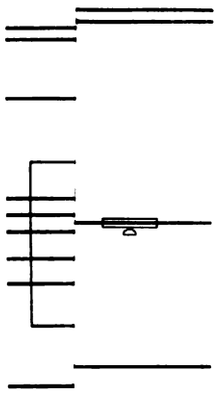

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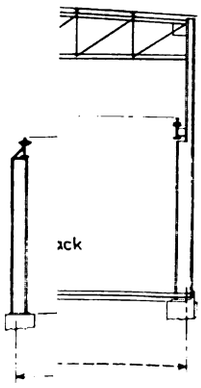
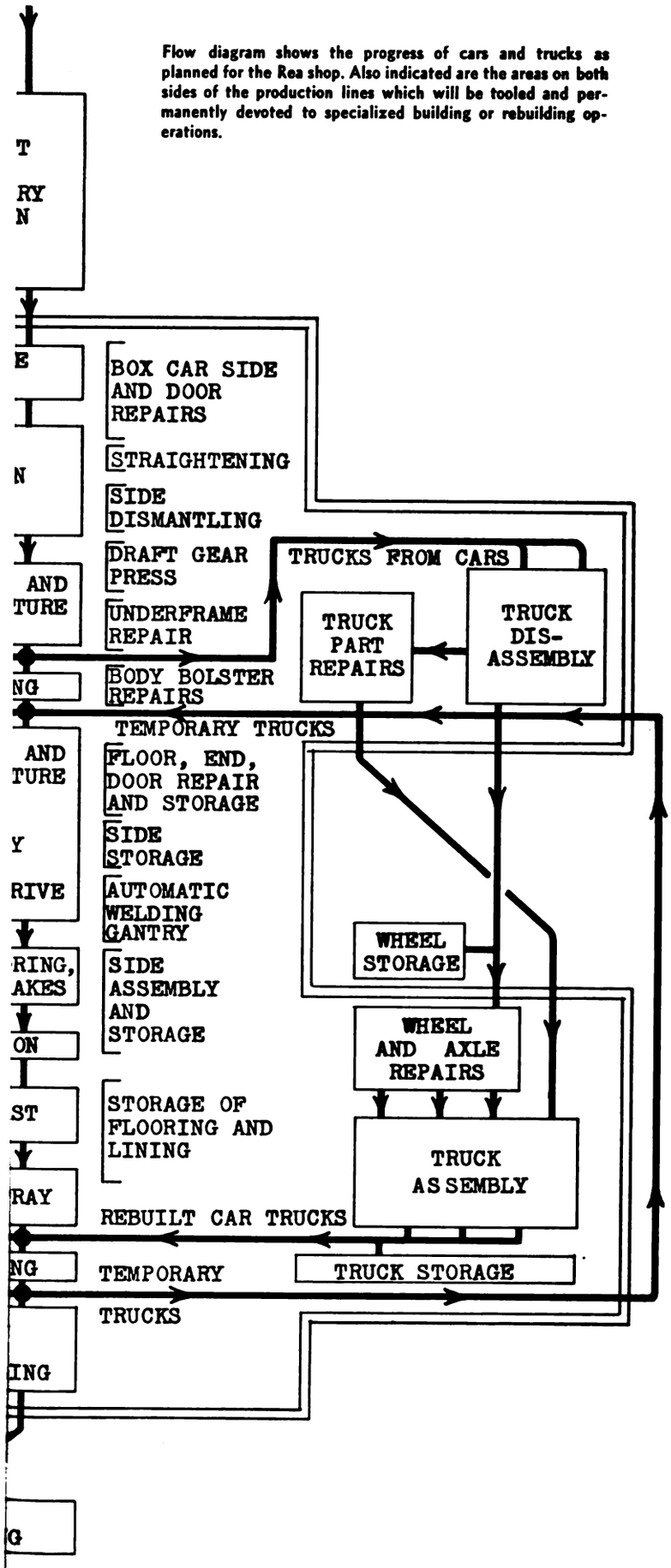
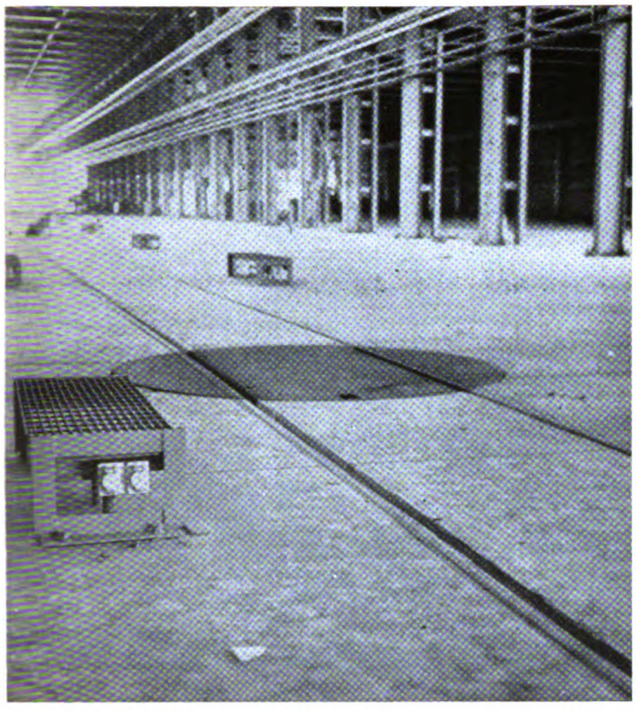


Flow diagram shows the progress of cars and trucks as planned for the Rea shop. Also indicated are the areas on both sides of the production lines which will be tooled and permanently devoted to specialized building or rebuilding operations.





Turntable installed in the shop floor is duplicated at many points where car trucks leave or enter production line tracks. Air, oxygen, acetylene and electric current for welding and for operating lamps or shop tools are supplied from the service boxes spaced at frequent intervals along the production tracks.

moved to the wheel and axle shop. Side frames and other truck parts are built up, annealed and transferred to the truck assembly area. Here the restored axle and wheel sets, and the rebuilt truck components are reassembled and move back into the main production line. In the meantime, the body has been rebuilt and inspected. After the blasting equipment is installed, cars will pass through a grit blast for cleaning prior to painting. Also scheduled for delivery next year are traveling paint spray booths which will be installed over each of the production tracks and will follow the grit blast operation.

The freshly-painted, rebuilt body then goes back onto road trucks. The temporary shop trucks that carried the car through the assembly, cleaning and painting operations move back up the production line for reuse. The car is stenciled while still in the car shop. Finally it moves out on to the scale for light-weighing.

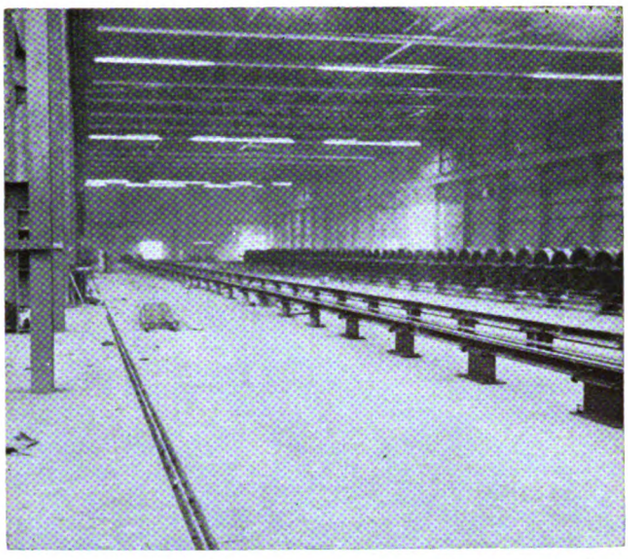
Car movement through the production line is to be accomplished by floor-mounted winches which will have the capacity to move up to four cars at one time. Twenty-four of these winches will be installed along the three tracks. Material will be moved to the production lines with shop trucks and with overhead cranes which span every bay. These overhead cranes also will be used in some of the production operations.

A daily output of 50 cars from the new shop is based on two shift operation of each of the three repair tracks. Third shift activities would be devoted to cleaning up and restocking the production line for the next day's operations.

What Makes the Rea Shop Run?

(Examples of equipment being installed)

6 Transformer and switching stations with a total of 14,000 kva. There are two 1,000-kva units and four 3,000 kva-units.
2 500-hp automatic boilers for oil or gas firing.
2 3,000-cfm air compressors with 500-hp synchronous motors.
16 Overhead traveling cranes. All have spans of approximately 90 ft, and capacities range from 7.5 to 25 tons.
24 Car-pulling winches.
3 Grit blast units.
3 Traveling paint spray units.
1 Freight car scale.

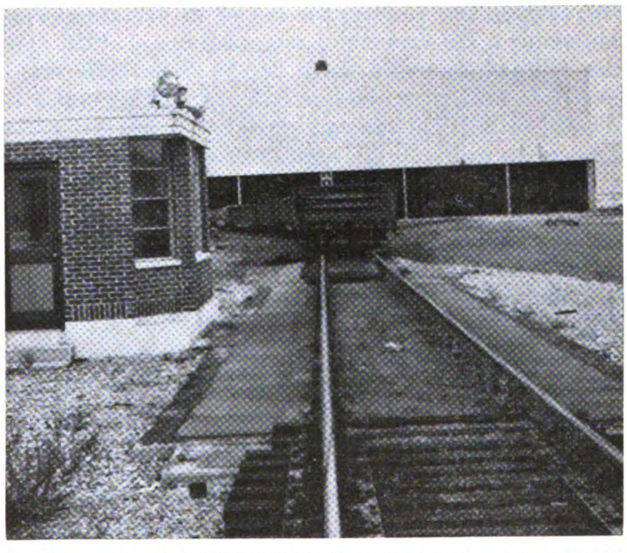


Trucks from cars being shopped are torn down and rebuilt in two bays on the north side of the main shop. Both these truck sections open into the main area and cross tracks are used to move the trucks into and out of them.

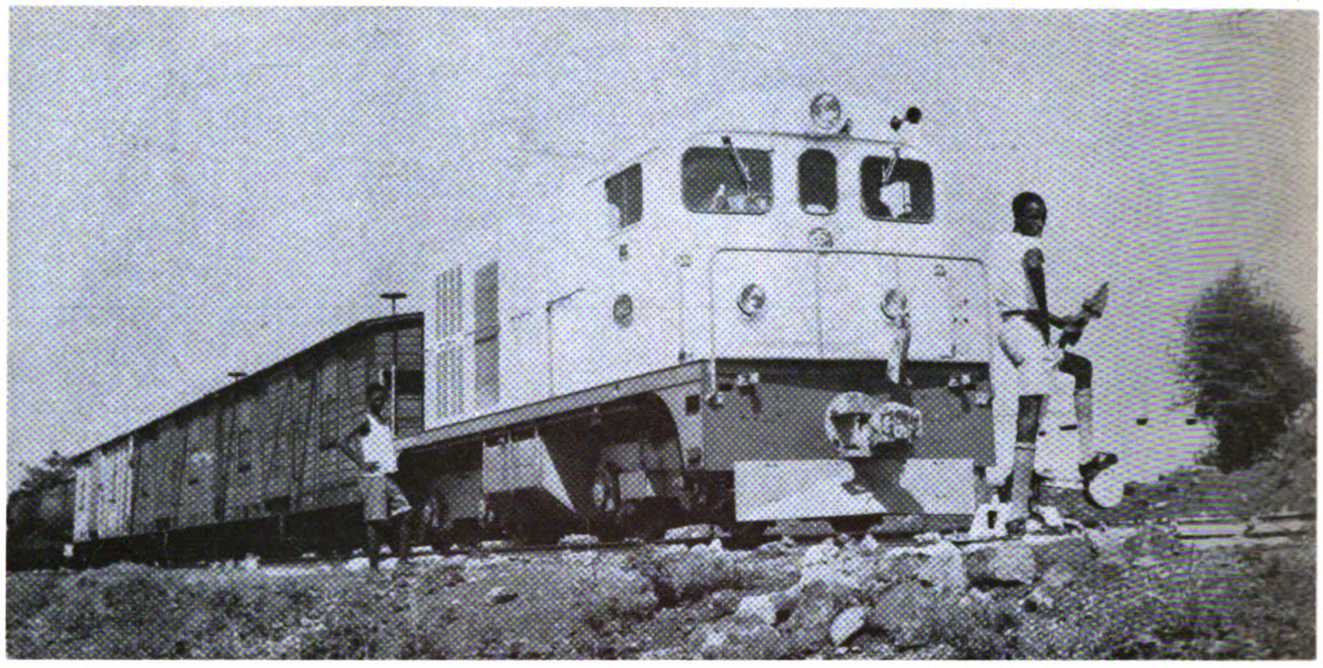
What About Altoona?

The Samuel Rea Car Repair Shop is operated as a part of the Altoona Works, and is under the direction of the works manager. The establishment of the new shop requires changes in the car repair organization as widely scattered groups at Altoona are consolidated at Hollidaysburg.

While it could be utilized for car assembly, this new shop is primarily a repair operation. The equipment and layout at Samuel Rea has been chosen and designed for straightening, welding, restoring and assembling car components. Production of new parts—operations typically requiring shearing, punching, forming and forging—will continue to be done in the well-equipped fabricating shops at Altoona.



Repairs completed, final step will be light weight determination on this 63-ft scale located just beyond the switches where the three production line tracks converge into a single outbound track.



Looking much like American switchers, some of the meter gauge Alsthom units are already in road service although the last unit is not scheduled for delivery until November.

In Africa as in the U.S.A. . . .

Railroad Is Completing Dieselization

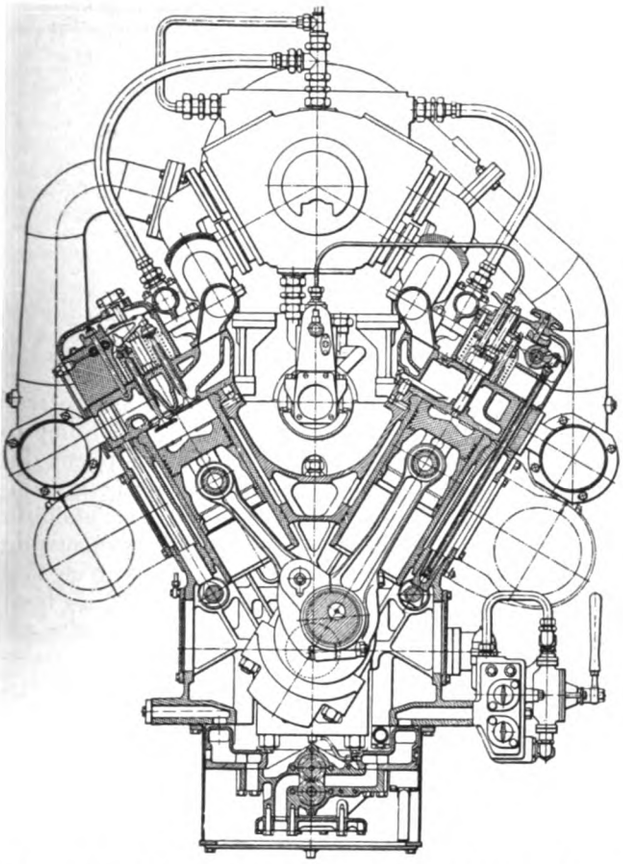
R. J. Bender
assistant to the president
SINCLAIR PETROLEUM COMPANY

Railroads on every continent are becoming completely dieselized. November will see the end of steam operation of the Franco-Ethiopian Railroad when this 500-mile narrow-gage line receives the last of its new diesel road locomotives. The first major step was taken in 1950 when the railroad received twelve 580-hp Swiss-built diesel-electrics. Previously the line had operated a number of diesel powered Fiat rail cars providing passenger service between its main cities several times a week.

The Franco-Ethiopian operates from the Red Sea coast in French Somaliland westward across deserts as it ascends to the 8,000-ft elevation of the Ethiopian plateau and reaches the Ethiopian capital of Addis Ababa. In the first 200 miles of this east African line—the desert section from Djibouti, Somaliland, to Dire Dawa, Ethiopia—there are frequent sand storms and only limited supplies of very poor water. This was the section of the road that was first opened 50 years ago and is just now being rebuilt to more modern standards. The line that climbs from Dire Dawa to Addis Ababa was built more recently and to higher standards. The climate here is temperate.

The desert section was the first to be dieselized. The 1950 locomotives had to be specially built with an axle loading of only eight tons and with sealed and pressurized cabs to keep out sand. These units have special air filters, and high-capacity radiators for adequate cooling at torrid desert temperatures. By 1954, after four years of opera-

Imperial inspection—Emperor Haile Selassie and the president of the Franco-Ethiopian line leave the cab of the first unit delivered.



Cross-section of the 675-hp V-type MGO diesel which is used in the Alsthom road units now being delivered.

tion, the 12 SLM road units had established performance and economy records which led to an order for additional road power and also for 10 switching locomotives. The Franco-Ethiopian had found that its serious desert water problem had been eliminated. The units were operating at one-third the cost of coal-fired steam locomotives and at half the cost of the oil-fired Mikados. Service has been speeded by eliminating water stops and utilization improved because of more rapid turning. By August 1955 two of these original locomotives reached their half-million kilometer mark—310,000 miles, and all had over 250,000 miles of service.

The expense of equipping units for desert service did not have to be repeated to dieselize the remainder to the railroad. The six Alsthom locomotives are a standard type which has been built for service in many countries including Holland, Spain, Pakistan and Madagascar. They have the same mechanical and electrical equipment irrespective of the track guage for which they are built. The 12-cylinder MGO diesel engine is built with a crankshaft that has main and crank journals of the same size. This means that only one size of the steel-backed copper-lead bearing shell has to be stocked. The engine has an outside oil pump independent from the normal one which makes it possible to drain the oil without unplugging the crankcase and also allows oil to be circulated prior to starting the engine.

The main generator powers four traction motors. These locomotives in service on the western end of the railroad can have an axle loading of 11 tons and do not have to have the idler axles used on the 1950 units. The locomotives are shunted manually when accelerating, but make backward transition automatically. A nine position electropneumatic throttle controlls the engine speed. Pressurestats shut down the engine automatically if lube oil pressure drops below 21 psi or if water pressure drops below 3 psi. Thermostats protect against overheating.

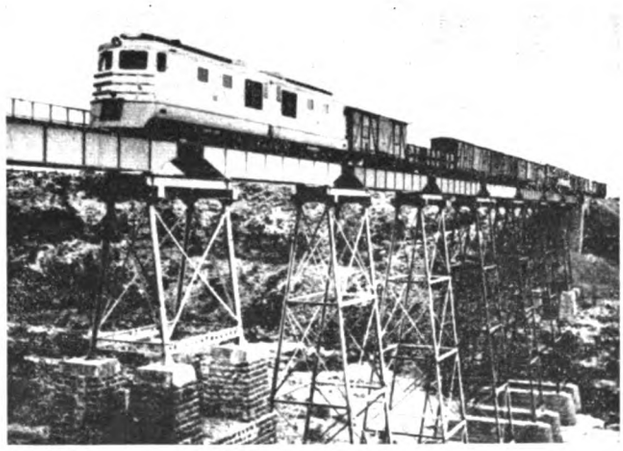
Ten switching locomotives were purchased at the same time as the last six road units. These switchers all have hydraulic transmissions. This transmission was chosen because of the lower possible continuous speed. Also it was felt that this transmission would be less subject to high humidity—a factor at the railroad's seaport terminal. The locomotives are considerably lighter than comparable diesel-electrics.

Although the end of steam means that locomotive water no longer is a problem along the Franco-Ethiopian line, the storage and distribution of water has been continued. It is the only supply for many of the people along the railroad. The completion of Franco-Ethiopian dieselization in November 1955 coincides with the 25th anniversary of emperor Haile Selassie's ascension to the Ethiopian throne.

FRANCO-ETHIOPIAN'S METER GAUGE DIESELS:

Service	Road	Road	Switcher	Switcher
Number of units	12	6	6	4
Type	A1A-A1A	B-B	C	C
Date built	1950	1955	1955	1955
Builder	SLM, Switzerland	Alsthom, France	Coferna, France	Billard, France
Horsepower	580	675	207	276
Diesel engine:				
Arrangement	In line	Vee	In line	Vee
Supercharged	Yes	Yes	No	No
Cylinders:				
Number	6	12	6	8
Bore	*	6 7/8-in.	4 7/8-in.	4 7/8-in.
Stroke	*	7 1/8-in.	7 1/8-in.	7 1/8-in.
Builder	SLM	MGO	Poyaud	Poyaud
Transmission:				
Type	Electric	Electric	Hydraulic	Hydraulic
Builder	Brown-Boveri	*	Voith	Voith
Weight, metric tons	55	46	*	*

*—Information not available.



Multiple-unit locomotive using two of the SLM units crosses one of the high trestles at the eastern edge of the Ethiopian plateau. Railroad's motive power chief said that what he needed to pull trains in the desert country was a "slow speed sand submarine."

Air Brake Association Has Sparked Changes in Equipment and Maintenance

C. V. Miller
President

L. Wilcox
Sec.-Treas.

Exchange of ideas, discussion, and education have all been goals of the Air Brake Association since it was formed in 1893. The 47th meeting heard these aims restated by C. V. Miller, president. The group has fostered progress and invention through its work, according to Mr. Miller. Supporting his remarks are two recent developments that have been preceded by many association discussions. The success of the pressure maintaining valve was reported at one session devoted to discussing the 1954 Convention-In-Print in which a paper on this subject was printed. For years the association has been discussing methods of preventing undesired brake actions caused by train line leakage. The pressure maintaining valve compensates automatically for leakage and is speeding train operation.

Location of leakage in train lines, subject of many ABA papers, must be corrected on car repair tracks. A device for making a better single-car brake test has now been submitted to AAR member roads for letter ballot action. The reasons for developing the flowrator included in the redesigned single-car tester were explained, and the methods for making the revised test were given.

CD Compressor Maintenance Practices Vary

A survey of 14 railroads by the St. Louis Air Brake Club showed that what would be regarded as satisfactory lubrication and maintenance practices for the 3-CD compressor by one railroad would be considered unsatisfactory by another. The study did not attempt to determine what is the best lubrication or maintenance procedure, but was aimed at improving compressor performance and service life. The study showed there is no definite standard for satisfactory air compressor performance.

Although the complete rebuild period varies widely, the removal and cleaning of heads and valves is done more frequently. When there is no set time for this work, failure to pass the orifice test is used as a guide. On a time basis, railroads do head and valve work on a quarterly, semi-annual, and annual basis. To avoid burning up the compressor through a high-pressure discharge valve failure, some roads replace these valve discs each six months. If the discs are in good condition, they are then moved to other less critical locations.

Chrome plating is the most popular method of reclaiming both crankshafts and cylinders. Most roads do not refinish crankshafts undersize, and after chrome plating, this is frequently impossible. To reclaim a grooved crankshaft, metal spray may be used to build up the oil-seal surfaces, but chrome-plating is used for the main bearing surfaces. The importance of fitting rings to cylinders was stressed. When pistons are replaced in reconditioned cylinders, they are turned 180-degrees from the original position.

Both honing and grinding are used for refinishing cylinders oversize. With either, a wall finish of 15-40 microinches is obtained. Grinding on an accurate grinding machine will give a round bore with proper alignment to the mounting flange. This will not always be obtained with honing, which, however, can remove small imperfections with a minimum amount of material removed. However, honing does tend to follow the low spots and may change the alignment of the bore.

Other maintenance practices important in good compressor performance include frequent filter inspection and change, suitable break-in run after overhaul, replacement of oil seals when they are soggy or whenever the crankshaft is removed, and cleanliness of the intercooler. Alignment of the compressor when it is being installed in the locomotive is important. It should not be permanently aligned with the engine until the engine is permanently installed and even the fuel tanks of the locomotive are filled. Locomotive frames are built with a $\frac{3}{8}$-in. arc which levels when fully loaded. This practice reduces compressor bearing troubles.

In maintaining compressors, there are two general problems. First, an acceptable performance and service life must be determined. Second, the shop facilities determine the amount of reconditioning and restoring that can be done. The committee believes that the higher quality of maintenance during overhaul, the less frequent the maintenance interval and the probable lower overall maintenance cost. The only general standard performance level is the furnishing of ample air and lack of oil passing.

Along with suitable maintenance, satisfactory lubrication is important. The type of lubricant to use can be based upon cost, availability, detergent and inhibiting properties, and viscosity. Roads generally use diesel engine oil, reclaimed diesel engine oil, or a special air compress or oil. The special air compressor oil can be a straight mineral oil without additives. In most cases, roads reported satisfaction

with present lubricants. The report was prepared by a committee of the St. Louis Air Brake Club and was presented by D. McIntyre, MP, the Chairman.

Compressor Lubrication

During discussion one speaker asked if it was possible that a shop could maintain diesel locomotives and not be able to service the compressors. The majority of roads use the diesel engine oil for compressors but there are tests of special lubricants being conducted. The Canadian National, according to C. C. Maynard, cleaned up a carbonized head condition by changing to straight mineral oil and dropping the main reservoir pressure. Heads are now removed annually. Another CNR man said that SAE 30 mineral oil is used, and that the main reservoir pressure was dropped from 140 psi to 120 psi. He said the result has been better service, cleaner machines, and sufficient air supply.

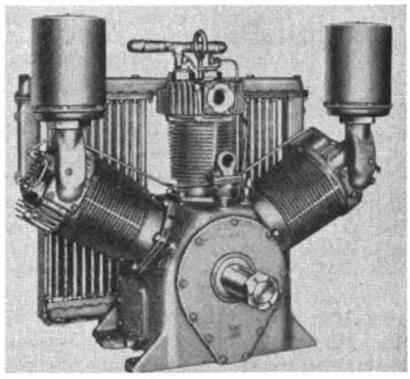
The Chesapeake & Ohio is using mineral oil and the Missouri Pacific is conducting tests with it. The Santa Fe cleaned up heads with special oil but has since been having bearing troubles. The AT&SF has reduced temperatures in compressors by installing a 3-in. discharge line and this has improved valve life.

Oil Carryover Vital Problem

The oil separators installed on diesel locomotives should be improved according to several members. The AAR Locomotive Committee has been considering this topic. The difficulty with present equipment according to L. D. Hayes, New York Central, is that only oil in the liquid form is removed, and the carryover which causes trouble is that which is in the vapor state.

The Missouri Pacific has not found a satisfactory separator. P. D. Hawkins, Erie, said that his railroad has encountered difficulty with fixed consist commuter trains. They feel that the vapor carry-over into UC passenger equipment is serious enough to cause poor brake operation, and that this same thing must be considered in the extension of cleaning time for the D-22 and D-24 valves now proposed. The Erie has had to clean the commuter UC equipment each six months because of carry-over.

The Frisco has replaced all armored hoses with standard rubber hoses according to A. M. Malmgren, general diesel and air brake supervisor. This followed a near accident when an armored hose collapsed and prevented the engineman from stopping a train. When an armored hose fails because of oil deterioration, there is no external indication that a blind gasket or choke has been formed. Since the public, management and operating men want safety and reliability, the Frisco has been making the change.



Westinghouse 3 CD Compressor

HOW ARE 14 RAILROADS HANDLING THE 3-CD COMPRESSOR?

	Answers	Majority
A. Lubrication		
1. What weight or viscosity of oil is used?	SAE 20 to SAE 40	SAE 30
2. How often is oil changed?	Adding by make-up, mileage, observation, analysis, quarterly, semi-annually	Quarterly
3. Is lubrication of compressor satisfactory?	13 yes and 1 no	Yes
4. What is minimum oil pressure permitted on compressors in service?	At idle 4 psi Up	4 or 5 psi
	At rated speed 15 to 35 psi	15 psi
B. Maintenance		
1. At what period are compressors removed from unit for overhaul?	One to six years	With engine overhaul
2. How often are heads and valves removed and cleaned?	Quarterly to Annually	Semi-annually
3. How often is lost motion between connecting rod bearing and crankshaft checked?	Quarterly to complete overhaul	Complete overhaul
4. How is lost motion between connecting rod bearings and crankshaft measured?	Visually and feeler gage	Feeler gage
5. What is done when crankshaft is grooved?	Grinding undersize in steps from 0.010 to 0.040-in., and chrome plating to original dimension	Chrome plating
6. What are tolerances on the following parts before they are scrapped, reground or plated?		
A. Crankshaft Throw:		
1. Tapered	0.002 to 0.040 in.	0.002 to 0.004 in.
2. Out of Round	0.001 to 0.010 in.	0.003 in.
3. When above limits are exceeded, what is done?	Scrapped, undersize steps, and chrome plating	Chrome plating
4. If refinished, what undersize steps are used?	0.010 in.	0.010 in.
B. High Pressure Cylinder:		
1. Tapered	0.002 to 0.030 in.	0.006 to 0.010 in.
2. Out of Round	0.002 to 0.030 in.	0.008 in.
C. Low Pressure Cylinder:		
1. Tapered	0.002 to 0.030 in.	0.008 in.
2. Out of Round	0.002 to 0.030 in.	0.008 in.
D. When above limits are exceeded, what is done?	Scrapped, undersize steps and chrome plating	Chrome plating
7. If cylinders are refinished oversize, what steps are used?	0.010 in.	0.010 in.
8. What method is used to refinish cylinders in oversize steps?	Micro-grinding and Honing	
9. Give clearances and condemning limits for parts listed below:		
A. L.P. Cylinder to piston: Minimum	0.004 to 0.010 in.	0.006 in.
Maximum	0.008 in.	0.008 in.
B. H.P. Cylinder to piston: Minimum	0.004 to 0.020 in.	0.004 in.
Maximum	0.006 to 0.008 in.	0.006 in.
C. Connecting rod bearing to crankshaft:	0.002 to 0.006 in.	0.002 in.
D. Total side clearance, three connecting rods:	0.006 to 0.020 in.	0.020 in.

Single-Car Leakage Test Undergoing Changes

Air leakage in train brake systems continues to be a major problem. Testing for Leakage on Repair Tracks was presented by M. J. Alger, Jr., of the New York Air Brake Co. It follows a number of other papers previously presented to the association on the subject of train line leakage. This paper reviewed the background of leakage studies and showed how this led to the redesign of the single car testing device.

The brake pipe of a train is the most important non-operating part of the brake system. Through this connected 1¼-in. pipe passes all the air necessary to charge and release all the train brakes. The brake pipe acts as an orifice and has all the characteristics of an orifice. The longer the train, the greater resistance there is to air flow. Once a brake system is fully charged, the only cause for air flow in the brake pipe other than to release or recharge is leakage. The average freight car has a minimum of 51 points from which leakage can occur when the car is fully charged.

Pinpointing Leakage

Of the points where leakage can occur, 27 or more are in the brake pipe itself. This leaves 24 points of leakage (including 17 in the AB valve) which are included in what is called system leakage. All of these points can be on the reservoir side of the charging port. Leakage occurring at these 24 points is not taken into account by any brake pipe leakage test. It results in an increase of air flow in the train brake pipe from the locomotive when the brakes are released and the train is charged.

AAR Air Brake Rule 25 (a) now requires that before a terminal air brake test is made, there cannot be a drop of more than 10 psi between the locomotive and caboose. This along with Rule 26 which now limits leakage to 5 psi per minute provide a check on the leakage of freight trains of any length. Long trains may have less than 5 psi per minute leakage and yet have a taper of more than 10 psi over the length of the train. When trains comply with the 10 psi taper requirement, it should assure enginemen that there will be little slack action caused by leakage.

In the individual car is much of the leakage in the made-up train, and it is the only part that can be checked. In establishing a maximum test value of total leakage from an individual car, allowance must be made for leakage that might occur from hose coupling gaskets when the car is coupled into a train. It cannot be predicted or tested on the repair track. Test rack tests by air brake manufacturers on 150 coupled sets or brake equipment showed that when a train line charged to 70 psi had leakage of 0.22 cfm per car, then such a train would comply with both the leakage and taper limits. This continued to be true when the brake pipe pressure was raised to 100 psi.

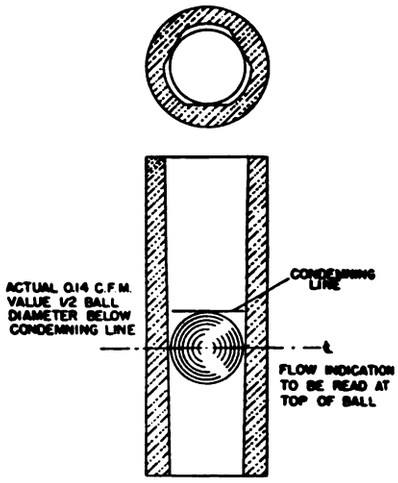
Flowrator Testing

Since 1952 tests have shown that it would be practical to test individual cars in a manner that would restrict allowable total leakage to 0.22 cfm. The amount of air flow necessary to maintain charged pressure with 0.22 cfm air loss is very small. A very sensitive device is required. The AAR Brake Committee has utilized a flowrator which consists of a ball float in a tapered glass tube which is calibrated to indicate the amount of air which is passing through the tube. The one used to check leakage from the brake system of freight cars is calibrated to read in cubic feet of free air per minute at 70 psi. Steady flow of air is necessary for quick and accurate check so a reducing valve that will maintain a constant pressure at the low rate of flow of 0.025 cfm of air in the charged line must be used as a regulating supply valve.

The Flowrator is used in conjunction with a diaphragm type by-pass cock. At the same time that the Flowrator was being incorporated in the single-car tester, the size of its air gauge was increased from 3½ to 4½ in. The Flowrator is placed between the old tester and the outlet (brake pipe) hose coupling. It must be reasonably vertical when it is used. A dummy test coupling has been designed to check the accuracy of the Flowrator at least once each day.

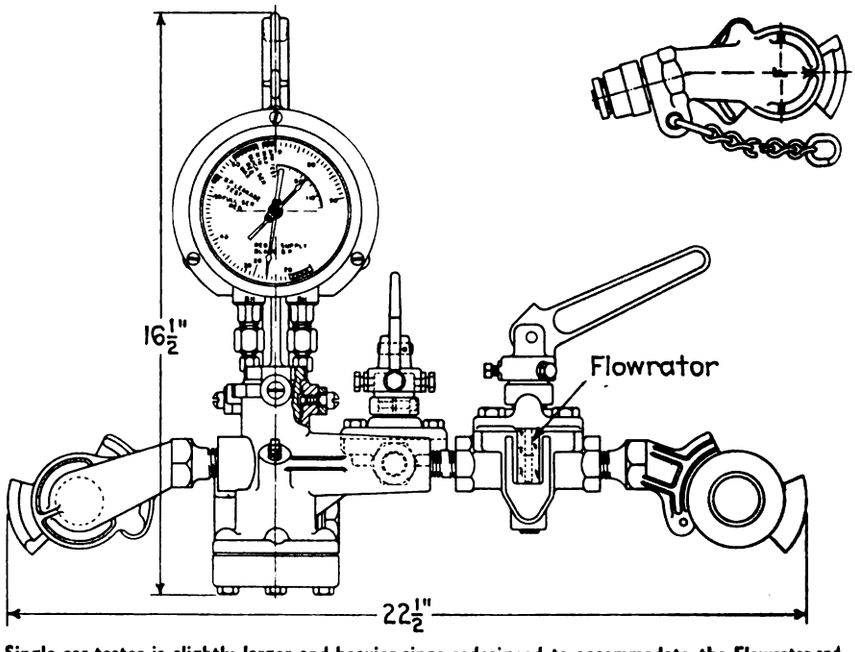
Original Flowrators provided a condemning line of 0.22 cfm. This meant that if the ball float reached the line, a leakage of as much as 4 psi per minute leakage could be expected from the average car brake pipe without any leakage from the AB valve or reservoir system. Since there is an unpredictable amount of leakage at hose couplings which is most serious in extreme cold weather, a margin to provide for this caused the condemning line to be moved.

Selection of a proper value for this could eliminate the need for the leakage test in the AAR code and leave the Flowrator determination of total system leakage as the only necessary one. Finally a con-



TRI-FLAT FLOWRATOR TUBE

Quanity of air flow is indicated by the height to which the float rises in the tapered flowrator tube.



Single car tester is slightly larger and heavier since redesigned to accommodate the Flowrator and the larger air guage.

demning limit of 0.14 cfm was chosen. If 70 percent of leakage is in the brake pipe and 30 percent in the remaining system (tests have shown this to be typical in either warm or cold weather), the maximum flow allowed with the new limit would mean 2 psi per minute in the brake pipe and 1 psi per minute in the remainder of the system. If all the leakage was in the brake pipe and none in the system beyond the charging ports, there would be no more than 3 psi per minute brake pipe leakage. This would leave 2 psi per minute leakage to be tolerated at coupling gaskets.

Using the Flowrator

The device must be calibrated each day by using the dummy test coupling and seeing that the float rises to the zone between the condemning line and the top of the tube. It is rugged and light in weight. Air passing through it should be as clean and dry as possible. Filters in the supply line and in the tester should be properly maintained. The tube and float must be cleaned with a suitable solvent.

When applying the test to a car, the device should be within 15 degrees of vertical when readings are made. Connect the end marked BP to the brake pipe hose at one end of the car—preferably the B end. Testing is done as follows:

1. Move handle to position 1 after making sure the Flowrator by-pass cock is open.
2. With both angle cocks open, note that there is a continuous blow of air from the open hose at the other end of the car, and then couple on a dummy coupling and charge the brake pipe and reservoirs to 70 psi.
3. After 10 minutes the Flowrator by-pass cock may be closed to determine if the system is sufficiently charged to get a flow reading.
4. If the float is not above the condemning line, open the by-pass cock and proceed to Test 1 in the Code.
5. If the float is above the condemning line, reopen the by-pass and continue to charge the brake system. After 15 minutes from start of charging again close the by-pass. If the float is still above the condemning line, make a complete check for leakage.
6. When leakage has been eliminated or reduced to keep the float below the condemning line, proceed with Test 1 in the Code.

What Has Flowrator Done?

A quicker, easier and more accurate check for brake system leakage has resulted from the new testing device. While most cars leave repair tracks with no more than 2 psi per minute brake pipe leakage, they almost always have other leakage not discovered by the present test. With the Flowrator there is a method of quickly evaluating this type of leakage. Use of the new Flowrator has been the subject of an AAR Letter Ballot and Mr. Alger reported that the device had been overwhelmingly approved.

R. J. Drewsbury, C&O, reported, during the discussion, that his road has used one of these devices for two years and that it has required no maintenance. It has been cleaned twice and retains its original accuracy which is checked daily as specified. The Canadian National, according to C. C. Maynard, has been trying one of these devices. When it has been moved from one shop to another, the men who have been using it have always been reluctant to give it up. There was some discussion about the conversion of the present single car testers. The changes can be made by the railroads—the tester does not have to be returned to the manufacturer. The larger gauge and Flowrator add 3 lb to the weight of the device.

Justifying Air Brake Equipment and Maintenance Costs

Balancing the ledger to determine if the increased cost of better maintenance and equipment can produce savings from improved performance is seldom easy. Air brake men find this especially difficult. Details and cost figures were forgotten as the Manhattan Air Brake Club presented the broad overall problems that confront Air Brake Association members.

Obvously there is a better operation and less trouble when more money is spent to improve the quality of equipment and maintenance. However the problem of attaching a dollar and cents value to decreased train delay, fewer injuries, less damage to lading and equipment, and better public relations is not easy.

Good maintenance must first come from the design of the air brake equipment. Grommet type compression fittings particularly at the angle cock were cited as a recent development that can be producing improved performance. Supervisors and maintenance men must know their jobs and must have the facilities and time to do them.

J. H. Russell, superintendent air brake equipment, NYC, summarizing the report said that economies to be realized with good maintenance of freight brakes can now be seen to appear in the following: (1) operation of longer trains during the winter; (2) reduction in terminal and yard delays; (3) reduction in costs for terminal and yard time; (4) reduction of delays enroute; (5) less delays to other trains; (6) reduction in personal injuries due to better air brake control; (7) reduction in damage to lading and equipment; (8) higher utilization cars and locomotives; (9) lower gross per diem charges; (10) reduction in derailments and other accidents; (11) reduction in the number of cars and locomotives to handle the same amount of traffic; and (12) savings in fuel costs.

The potential for obtaining increased traffic for the railroads is enhanced by good maintenance. This would be chiefly due to improved public relations brought about by: (1) improved safety in train operations; (2) on time delivery of shipments; (3) less damage to lading; (4) satisfied shippers being possible passengers; and (5) the psychological effect of good performance.

Slack Adjusters Discussed

During discussion F. W. Dell, supervisor of air brakes for the Grand Trunk, emphasized the importance of leaving slack adjusters for train yard adjustments, and adjusting piston travel in the dead and cylinder levers and the bottom rods when cars are on shop tracks. He subsequently said that he felt it would be worth-while for the ABA to recommend the mandatory installation of automatic slack adjusters to the AAR committee.

At the same time, T. H. Bickerstaff, general air brake supervisor for the Santa Fe, mentioned the drive to make changes in the provisions of Interchange Rules 100 and 101 mandatory, and asked that ABA members lend their support to this drive. It was brought out that the change in Rule 101 was approaching approval and that the principal delay was one of pricing agreement. This comes about because if a car is frequently on a repair track for other work, it would have its piston travel regulated far more frequently than necessary.

Pointed out was one car that was on 16 repair tracks in a single trip across the country. Had Rule 101 been mandatory, there would have been charges for 16 piston travel adjustments against the owner. Another speaker emphasized that the adjustments in piston travel should be made in the rigging and not in the slack adjusters on passenger cars and locomotives as well as freight equipment.

There was some discussion of the variations in designs of manual slack adjusters. The danger of having a man go under a car to make the brake adjustment was minimized by one speaker who said that when such work is being done, the train is under blue flag protection. Another speaker said that his equipment could be regulated from along side the car. It had been proposed that the ABA take action to urge further manual adjusters be built so that they can be adjusted alongside the car instead of under it.

Pressure Maintaining Speeds Trains

A few years ago the Rio Grande began trying, to modify its original 24-RL locomotive brake equipment to achieve the same results obtained by enginemen on steam locomotives who used various methods of trick braking. All the schemes that had been developed attempted to make up the train line leakage and maintain the same reduction that had originally been made with the brake valve. Manufacturers have since designed the DS-24-M pressure maintaining brake valve to modify the 24-RL equipment and get results obtained previously only by skilled enginemen.

The D&RGW first considered its work with pressure maintaining a tool for braking on long mountain grades. It has since been used in districts with rolling profile where slack action is prevented by working power against a small but well maintained brake reduction. The Rio Grande continues to use retainers in some districts.

Savings of as much as two hours over the Pennsy's Pittsburgh Division between Pitcairn and Altoona have resulted from putting pressure maintaining valves on the road locomotives. The 11-mile East Slope which passes through the Horseshoe curve into Altoona previously required that a stop be made at the top for setting up retainers. Retainers are now turned to the fourth position by car inspectors on all but the last ten cars of the train before it starts over the Pittsburgh division.

According to a member from the Pennsylvania, the flat maintaining brake valve enables trains to come to a complete stop on the descending grades safely. Also, the retainers set up on the train permit a complete release and reapplication when necessary without making a complete stop.

Both Rio Grande and Pennsy were reported to regard the dynamic brake as essential for successful pressure maintaining operation on grades. Most of the holding is done with the train brakes, and variations in train speed caused by changes in grade or curvature are corrected with the dynamic.

The DS-24-M brake valve has proved popular with enginemen in all territories. For the first time the enginemen are said to really have complete control of train braking. It no longer varies with leakage. Successful pressure maintaining valve installations should place the equalizing reservoir close to the brake valve according to one member.

Roads that operate through districts which experience widely varying temperatures have the greatest difficulty with water in the air brake system, but during a discussion of the 1954 paper "Diesel Locomotive Compressed Air System," several roads reported improved performance when automatic drain valves are used. According to T. H. Bickerstaff, general air-brake supervisor, Santa Fe, the device is cheap and effective, but not a complete solution. The AT&SF is now putting these valves on all its locomotives. The Illinois Central is reported to have experienced difficulty with failures of components of the drain valves inside the reservoirs. These failures are difficult to find and removal of broken parts has not been easy.

The Erie has had satisfactory performance from its drain valve applications, according to P. D. Hawkins, general air brake inspector. Freezing was prevented, but at the same time the radiation surfaces on the locomotives were increased.

C. C. Maynard of the CNR said that road has increased radiation surfaces to eliminate water and oil from locomotive air brake systems. This has sometimes resulted in freezing on the locomotive rather than in the train line and has been a problem in itself. The CNR has enlarged the size of the piping in the aftercooler.

CNR locomotives assigned continuously to districts that have consistent sub-zero temperatures do not experience freeze-up troubles. Because most steam locomotives do not make long engine runs, they do not have the failures that befall diesels that start runs in mild temperatures and then run into very cold zones.

A discussion of a paper on high speed braking presented by H. J. Ainsworth in 1954 lead to a discussion of thermal cracking of diesel locomotive wheels. Mr. Ainsworth said that his paper had not been prepared for locomotives but was based only on coaches in high-speed service. He was not prepared to discuss locomotive wheels, but did read the following quotation from his paper: "Realizing that some of the brake and wheel troubles might be attributed to increased wheel loads as well as speeds, it has been proposed to limit the load that could be imposed upon wheels in faster service to 400 lb per in. of wheel diameter. If we specify a wheel load be restricted to 400 lb per in. of wheel diameter, the wheel load of 14,400 lb would be permitted for a wheel 36-in. in diameter. Such a wheel load is approximately the same as now found in conventional Pullman car service."

The Santa Fe has difficulty with road switcher wheels when these units are in high speed service. They develop thermal cracks according to Mr. Bickerstaff. The Pennsylvania has equipped passenger units with larger diameter wheels to eliminate thermal cracks according to one speaker. This was based on the experience of the Lackawanna where the same thing was done. It was developed that the DL&W also stopped using the locomotive brake and relied only on the train brake with these large-wheeled units. One member said that an ICC man had told him that they found more thermal cracks on 42-in. wheels and that the 40-in. wheels had been the best performers. Discussion of all the 1954 papers was conducted by C. H. Miller, ABA president.

Standardization Would Affect Angle Cocks, Bell, Horn and Train Signal

A committee report submitted by A. M. Malmgren, chairman, continued the work of making recommendations for standardization of diesel and turbo-electric locomotive brake systems. It has been proposed that there be an operating valve for fireman control of the bell ringer. It was also suggested that there be an extension of the horn rope to this location.

The use of standard angle cocks on the ends of these locomotives was recommended. This angle cock should be of the side vent type to exhaust air from the hose before hose parting. While the proposed angle cock should be located in the same position as that for a car, it could be backed up by a cut-out cock under the locomotive skirting to close off the train line in event of a collision.

Freight units average five to six right angle bends in the brake pipe between angle cocks, and the road switcher types average eight such bends. Mr. Malmgren stated that 90-degree bends are equivalent to 30-ft of the brake pipe and the presence of 31 bends between the ends of a four-unit locomotive are equal to 900-ft. of additional train line. The committee is interested in having locomotives with a minimum number of 90-deg. bends to reduce brake system charging time.

There was some discussion about the proposal that B units be equipped with air feed so that there would be more rapid response to air signal. It was felt by the committee that each unit should have an NS-1 reducing valve for this purpose. One proposal was that additional capacity should be provided from the A units by boring out the choke in the air signal feed. Doubt was expressed in the desirability of using the multiple NS-1 valves and attempting to give them all the same pressure setting.

The success of the filter element in the brake pipe between the brake pipe cutout cock and the distributing valve in the D-24 and AB valves led the committee to recommend that a filter of the D-24 type be made standard for the 6BL and 6SL equipments. This element assists in preventing oil from the compressor, pipe rust and scale, dirt, and water from sticking the distributing valve piston rings in the equalizing portion. The element would be required to pass the same tests and inspections given to it in the D-24 equipment.

Carmen's Responsibilities Continue to Grow

R. Schey
President

F. H. Stremmel
Sec.-Treas.

Defective cars cause about $6,000,000 annual damage due to loss and damage directly traceable to that source and much more than that amount because of factors such as rough riding, unfit draft gears and interior fastenings. These figures—presented by C. A. Naffziger, director of the AAR Freight Loss and Damage Section—show but one of the many categories of problems that groups like the CDOA can solve through the interchange of thinking that occurs in the preparation of its reports and during discussions at its meetings.

In addition to the reports and addresses covered in these pages, there were reports on loading rules, car-painting, and freight-car construction.

That the problems requiring solution will grow was the subject of President Schey's address which opened the three-day session.

On this subject he said, "Car department men today have more and more responsibility with the various types of special equipment, and since our last meeting, we have a number of new types of equipment to contend with. Piggyback is here to stay, and on most railroads not only the design and maintenance of equipment, but also the tying down is our responsibility.

Mechanically equipped refrigerator cars are also showing a considerable increase in ownership, and again, the car department must inspect and service this equipment. Many other special types of equipment are being installed to hold or bring back business to the railroads. We refer to specially equipped gondola cars for steel loading to eliminate blocking and shrouding costs, which gives us an advantage over the trucker.

In addition, we have special equipment for the automotive industry, also box cars with loading devices loading and holding down loss and damage claims. Many more types of equipment will be in service in the years to come, and the design and maintenance of this equipment is the responsibility of the car department.

Become Better Informed

President F. S. Hales of the Nickel Plate outlined two broad approaches to helping railroads get more business. First, he said the rail carriers can attract new customers and win back former customers "by trying harder to meet specific requirements of shippers."

Mr. Hales also called attention to the need for "all railroad people" to become better acquainted with the report issued last April by President Eisenhower's cabinet committee on transportation.

This report found, Mr. Hales declared, that present government policies on transportation "prevent the most economical use of the transportation plant, with the result that shippers and ultimately the consuming public bear unnecessary costs.

Legislation has been introduced in Congress to put into effect the basic recommendations of the cabinet report, Mr. Hales continued.

"I cannot urge you too strongly to become well informed on provisions of the report and the legislation supporting it," he said.

"Your ability to discuss this matter intelligently with customers and friends will be very helpful in freeing the railroads from the straight-jacket which has prevented them from competing on equal terms for more than a score of years," he declared.

Lubrication Group Studies Hot Box

The present method of testing various lubricating devices appears to be too slow. Testing technique should be improved so that devices could be proved or disapproved quickly in the laboratory. This would eliminate impractical devices quickly and narrow the field so that some positive results could be obtained quickly. The number of devices being tested makes it difficult for the forces in the field. Instructions formulated in connection with lubrication devices should be made available soon and this will eliminate much confusion and clarify many questions for the forces in the field.

Signal departments on various roads are complaining of an excessive accumulation of oil on rails, causing trouble with signal operation. It is not clear whether the loss

of oil is from journal boxes or from diesel locomotives.

In the search for some other method of lubricating car journals, the waste-packed box should not be neglected. It will be here for some time and is an immediate problem that must be dealt with.

Therefore, waste specifications should be re-examined and improved and reclamation processes improved to insure good quality reclaimed waste. Study should be continued to develop supplemental cooling medium, such as ventilation of journal bearings and journal boxes. A journal lubricant which will function efficiently at all temperatures should be found. In the modern era of scientific development it does not seem unreasonable to expect such a suitable lubricant to be developed and made available quickly.

The repack period on waste packed boxes should be extended to 24 months and eventually to 36 months. If sufficient data is not now available to justify this extension it is recommended that it be accumulated.

There has been a substantial improvement in hot box mileage during the period from November through April but only modest improvement for May-October. A 78 per cent improvement occurred in the period November 1953 through April 1954 compared with a similar period 1950 and 1951. The same data indicated only a 25 per cent improvement in performance for May-October 1954 as compared with a similar period in 1951. This information suggests that the lubricating problem for May-October has not been adequately met. While there may be some dispute with mileage data, the evidence appears conclusive.

Rip track forces can make a substantial contribution to hot box control. In addition to Rule 66 requirements, they should make a careful inspection of wheels, truck bolsters, truck sides, side bearing clearances, journal boxes and center plates. Hot boxes have been caused by defective truck conditions even though journal boxes and contained parts are properly maintained and serviced.

Open top loads should be carefully inspected on repair tracks and train yards to be sure there is no unequal distribution of lading, which is another cause of hot boxes which have been caused by unequal distribution of lading.

While compliance with Rule 66 is general and uniform, there is a radical difference in the servicing of journal boxes between different yards prior to departure. Performance records studied show a positive relationship between the quality of service and road performance. Data available to substantiate this suggests that the present waste packed boxes if properly serviced can give a good performance.

The primary reason for the radical difference in journal box servicing is the lack of mandatory rules. It was therefore recommended that Sec. 9 and 10 of the Lubrication Manual be made mandatory and paragraph "B" of Sec. 10 be modified to read as follows:

Outbound Inspection: At originating terminals and classification terminals all journal boxes of cars scheduled for line movement must be serviced in accordance with mandatory practice outlined in Sec. 9.

While hot box set outs in road trains represents a major percentage of all on-line delays, there is still inadequate supervision in transportation yards to supervise and organize mechanical department obligations. Mechanical supervision in yards should be on an equal basis with operating supervision.

Consideration should also be given to an adequate oil supply, such as pipe lines to servicing areas, pressurized oil tanks on mobile equipment to eliminate the use of oil cans, improved tools for opening and closing journal box lids and making up trains on specific tracks to reduce servicing time. In short, the entire operation should be brought up to date. The situation now is something like trying to compete against a modern jet aeroplane with a 1920 automobile.

Suggestions made in the past for operating officers to participate in discussions and meetings on the lubricating problem are still considered practical because of the related interest of the mechanical and operating departments in expeditious train handling.

Appointment of a special sub-committee was recommended to work under the jurisdiction of the appropriate AAR Committee to study improved techniques of transportation inspection service, and this subcommittee should include a representative from the operating division.

The committee felt somewhat discouraged to note that well thought out recommendations of its predecessors had not been acted upon. If reports such as this were to have any significance, its recommendations must be processed through to some definite conclusion. It was suggested that a subsequent committee be assigned to review reports submitted by the lubricating committees from 1950 to 1955 and reports on action taken on the recommendations in such reports.

Chairman of the lubrication committee which prepared this report was W. J. O'Brien, general car foreman of the Nickel Plate.

Lubricator Discussion

In the discussion of the Car Lubrication report at the CDOA meeting the members expressed the definite opinions that lubricating devices using lubricating pads are the best hope for solving the hot box problem.

J. F. McMullen, superintendent, car department, Erie, set the general theme of the discussion when he said that if waste-packed boxes are with us for a long time to come then hot boxes will be with us just as long. He mentioned the large number of Erie cars on order and said that all of them would have lubricating devices with pads.

C. T. Hunt, assistant engineer tests, Pennsylvania, said that they had more hot boxes on their hopper cars than any other type. Of 30,000 hopper cars the Pennsylvania has installed lubricators on 6,000 cars. These latter have shown a five to one performance improvement over the cars without lubricators.

The member from the Kansas City Southern cited his war experience when 20,411 military railway cars built for European operation with waste-packed journal boxes had about a hot box per car in an eight-month period and the same type of cars with European lubricators under the same conditions had none.

J. R. Jennings, general manager, Wilson Car Lines said that the 63 cars with lubricators in service last year had 9 hot boxes but in most cases the hot box was due to mishandling of the lubricators because of a lack of knowledge by the servicing forces. In 1955 there has been a substantial improvement with only three hot boxes while the hot boxes in waste-packed boxes has increased.

President Schey of the CDOA summed up by telling the members to return home and sell their respective members on the installation of substantial numbers of lubricators, making a selection from the several types now available.

Fundamentals of Mechanical Refrigeration

The power plant for the majority of mechanical refrigerator cars consists of a diesel engine coupled directly to the alternator (a-c generator). Instead of the spark plugs found in the gasoline engine to ignite the fuel, the diesel depends on raising the temperature of the air in the cylinders to the point where it ignites the fuel. This requires a high compression ratio, particularly in starting. For this reason, some engines use auxiliary starting aids such as manifold heaters, glow plugs and ether starting aids which allow the engine to be designed with a lower compression ratio and hence lighter.

The glow plug is nothing more or less than a wire which becomes red hot when electric current passes through it. This helps to ignite the fuel that is sprayed at high pressure by the injector nozzle. After the

engine has run a few seconds enough heat is retained in the engine to sustain operation. The manifold heater is a similar device which heats the intake air for combustion and aids starting. The ether capsule (which should be released only after the cranking of the engine begins) lowers the ignition point to aid cold weather starting.

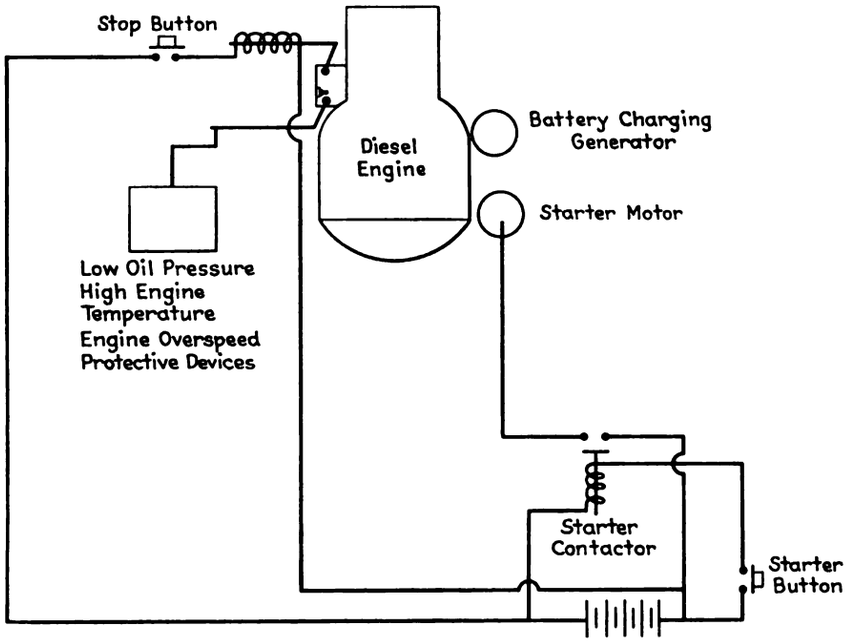
There are four major items of servicing that a diesel engine requires:

1. It should never be allowed to run out of fuel because the injector parts are precision parts that depend on the fuel for lubrication.
2. Clean fuel is of the utmost importance since small particles of dirt can stop an otherwise good engine.
3. The radiator must be kept clean and the water level carefully maintained.
4. The engine oil must be maintained at the correct level and be checked for dilution from fuel oil and other contaminants such as water and sludge.

There are three major ways to cool the inside of the car. In the cold plate car, large flat brine tanks attached to the roof of the car contain the evaporator coils of the freon system and frozen brine. Heat transfer from the load is by convection currents of the air within the body of the car. In the event of a power failure the frozen brine keeps the car cold for a period of time in the same manner as the old ice box.

The "envelope" car has a false ceiling, floor and walls through which is circulated air from the evaporator coils. The cooling air is never directly in contact with the lading.

The modified envelope car and the open circulating air cooled cars are much the same. The air circulating through the car passes over the load and cools it. The modified envelope car has the false ceiling perforated in order to allow cold air to pass over the load while the return air to the evaporator is drawn from beneath the floor racks to the evaporator. A very similar air circulation system is used in the the open car with the exception that the discharge air from the evaporator is forced directly over the lading.



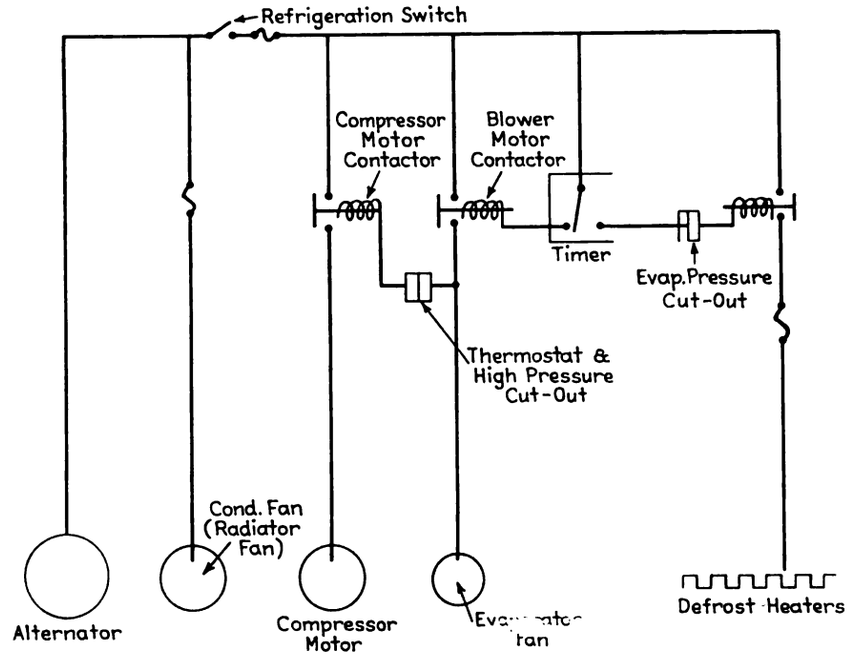
Pushing the "start" button closes the starter contactor, feeding current from the battery to the starter motor to turn the diesel engine over. The protective devices at the left automatically shut down the engine for the causes shown.

There are three basic types of refrigeration systems. The diesel engine generator plant powering an electric motor driven refrigerator system, the Thermo-King gasoline or semi-diesel engine which operates the refrigeration plant by direct connections and V-belts and the cold plate car with Fairbanks-Morse engine driving the refrigeration system by V-belts. The most noticeable difference in these systems is that the diesel engine-generator runs at all times with the refrigeration equipment cycling off and on to control the car temperature. The Thermo-King engine shuts down completely when temperatures are satisfied, and the compressor unloads on the cold plate car.

The refrigeration system is now complete with air circulation or "cold" transfer medium. It should work indefinitely except that moisture collected by this circulated air is deposited on the evaporator coils. This frosting on the coils acts as an insulation and reduces their efficiency in removing heat from the load. An indication of this occurs when the freon return line to the compressor frosts over.

A defrosting system melts this ice from the coils. In some diesel-electric systems this is done by electric heating elements. Other types by-pass the hot freon gases from the compressor around the condenser and to the evaporator to melt the ice off the coils.

De-frosting may be initiated in several ways. In some cases a pressure differential switch actually measures the amount of ice by detecting the restriction to air flow over the evaporator coils. Defrosting begins when the restriction exceeds a given



Schematic arrangement of the electrical circuits in a diesel-electric refrigerator-car refrigeration system. The timer, blower-motor contactor and compressor-motor contactor allow the diesel engine to come up to full rpm before being loaded.

HOW THE REFRIGERATION SYSTEM IS WIRED AND WHY

The radiator fan motor is directly connected across the 220-volt line from the alternator which supplies the power for the system which means that as soon as the diesel engine starts the radiator fan motor starts. Since this starting load is small the engine can handle it satisfactorily. However, the engine cannot handle heavy starting loads. Therefore, there are time delay relays and sequence relays that allow the engine generator to come up to full rpm before allowing the evaporator fan and later the compressor to start. This avoids excessive initial loads and protects the electrical equipment. Also seen on this diagram are the defrost heaters which have their own control circuits. The various control circuits on this equipment may be either a-c or d-c voltage.

***Note:* Another section of this report explained the fundamentals of a mechanical refrigeration system, with appropriate diagram.**

amount. Temperature of the evaporator coils starts it in other cases. In other installations the defrost is set on a time basis only—the defrost timer starts the cycle periodically holding the system in the defrost cycle until the evaporator temperature rises to a pre-determined setting.

When the car is in defrost, the compressor is shut down or the condenser coil is by-passed and the evaporator fan is stopped. Drain pipes carry off this moisture and they are heated in most cars so that their moisture will not freeze.

When the mechanical refrigerator car is once loaded with merchandise and billed to destination it is up to the railroads over which the car travels to give proper attention to the car so that it arrives at its destination without failure or damage to the lading. This may be the responsibility of any number of persons representing various departments in the railroad organization. The contract carriers also have their service and maintenance organizations. However, it should be the immediate responsibility of the car department through the train yard car inspector to report to the maintenance forces when a mechanical refrigerator car is not maintaining proper temperature. Refrigerator car maintenance personnel cannot be expected to check each train for mechanical reefers.

The car inspector cannot take time to do any more than check the car temperature and record it in his notebook along with the car number. This can be easily done and will prevent much difficulty. If a malfunction is found and reported, it then becomes the responsibility of the maintenance forces to locate and correct the trouble.

To tell the car inspector what temperature the load is supposed to carry, a card should be provided at the temperature gauge which will state the temperature setting. In this way the car inspector or the refrigerator car inspector will know at first glance if trouble is to be expected. Refrigerator car inspection personnel as a rule make the en route inspections and record the necessary information in the log book which is carried on each mechanical refrigerator car. But these men are not located at each point of train inspection and interchange. Therefore the train yard inspector should make needed observation and notation for proper control and necessary maintenance.

The log book on the car states who is to be notified in case of trouble and particulars as to proper fuel, lube oil, etc., to be used on the equipment. Through these log books the owners or operators can follow car performance and make necessary corrections at maintenance periods.

There are two general ways to schedule periodic inspections. The first is on the basis of hours of operation of the equipment (1,000-hr inspection, 5,000-hr inspection, etc.). This inspection relates inspection and maintenance needs closely to actual usage. It is usually used by contract carriers.

The second method is based on straight time. This method tells (2-month, 6-month and annual inspections) from day to day when each car is due for inspection and the cars can be called in for maintenance as required.

TEMPERATURE AT WHICH FREON-12 BOILS AT REPRESENTATIVE PRESSURES

Pressure, psi	Temperature, deg E
180	130
100	90
52	55
21	20
12	5
9.2	0
4.5	—10
0.5	—20
5.5 (Vacuum)	—30
11.0 (Vacuum)	—40

The en route inspection is strictly a matter of the individual railroad's policy. However, the committee felt that such inspections should be made at least once every 18 hours to protect the load and provide the necessary safety factor to allow time for repairs to be completed.

The interchange inspection should be made immediately before a car is released from one railroad to another. This protects the railroad which has had the car and probably initiated the shipment. It also serves to protect the customer since such transfers could otherwise lengthen the period between inspections to the point where a failure even though minor, would damage the load.

The committee also listed designations for various valves, switches, thermostats, contactors and relays used in four makes of mechanical refrigeration, which showed that few are the same. It, therefore, recommended that manufacturers of equipment standardize on symbol designation of the component parts as has been done in the diesel locomotive field through cooperation between the builders and the AAR. The report also included detailed trouble-shooting lists for the major components of the refrigeration system, each giving the cause, the symptom and the cure for most troubles that may occur. —Editor

This report was prepared by a committee of which M. B. Adams of the Santa Fe was chairman.

Wheel-Shop Practices

Recommendations by the committee on wheel shop practices included:

Revising Rule 355 (p) to make magnetic particle testing of pulley drive axles mandatory when wheels are processed through the wheel shop for restoration of tread and flange contour. The committee also recommended addition of a new Rule 355 (Q) to require magnetic particle testing of axles equipped with Spicer drives at wheel renewal.

The committee also recommended the use in freight service (as substitutes for one-wear wheels) of passanger car wheels which have been worn and turned down from a nominal 36-in. diameter to a nominal 33-in. diameter. The Milwaukee Road uses such turned-down passenger wheels which are nominally 33 in. after turning down on 5 by 9, 5½ by 10 and 6 by 11 freight axles. They adhere to compliance with Rule 98 of the interchange rules and the maximum wheel seat diameter is not exceeded by more than ⅛ in.

It is the committee's opinion that these turned-down wheels which have 6 by 11 seat and 7 9/16-in. bore can be economically utilized by adopting a 5½ by 10 freight

axle with forged center and a 6 by 11 wheel seat diameter. This 6 by 11 wheel seat diameter on a 5½ by 10 axle would be similar to that now utilized on 5½ by 10 passenger axle.

To permit realization of this economy, which has no apparent disadvantages, a change in Rule 98 was recommended to permit a full charge for a freight car axle with a forged center having all dimensional characteristics of a 5½ by 10 axle with the exception that the wheel seat be that of a 6 by 11 axle.

The Committee recommended, in view of the difference in radius on the back flange, that one gage be used for cast iron and one-wear wheels, and another for multiple-wear wheels, and that more dimensions be detailed in the drawings of the mounting gage in Fig. 117.

Par. 356-B should be changed to read that if a separate dial gage is used in wheel mounting the one on the recorder may be blanked out to eliminate any misunderstanding.

The Rule 355 (0) requiring that overheated journals be stencilled was recommended for change to call for steel stamps not less than ¼ in. high on the end or ends of the axle.

Rule 356 (B) should call for the testing of gages by means of dead weight tester only, and that the accurate master gage alternate be eliminated as there is no master gage in the true sense of the word.

Another recommendation called for extending to wheel shop practice the specifications for new axles in regards to seams (Manual of Standard and Recommended Practice, Sec. "A," Specification M-101-54).

This committee recommended that Par. 356 (i-3), (i-5), (1-7), (1-8), (1-9) and (1-10), Page 213, should be eliminated, and new Par. 356 (1-3) be added to read —"no double plate cast iron wheels, and no single plate non-bracketed design cast iron wheels (excluding the 650 lb size) can be mounted and are prohibited on all cars in interchange."

Where the new gage for wheel seat location in Supplement 2, Page 20, Exhibit "D" is used, Par. 355-E, Page 209, should read—"a taper of 1/32 in. diameter extending a maximum of ¼ in inward from dust guard seat must be turned in wheel on 7 in., 8 in., 9 in. and 10 in. journals and extending a maximum of ½ in. inward from dust guard must be turned in the wheel seat on 11 in. and 12 in. journals to insure true entry into the wheel and to prevent tearing and gouging during mounting." Also, dimension (C) in supplement distance from end of axle to taper should be (A).

The committee recommended specifying the limit of eccentricity on journals used with roller bearings to prevent re-mounting second hand axles with eccentric journals which would contribute to journal or roller bearing failures in service, as the wheel seats are only machined on roller bearing axles.

To eliminate any misunderstanding or misinterpretation in the wording, Par. 140, on 7 in., 8 in., 9 in. and 10 in. journals and 354-H, the committee recommended a change in the wording to read as follows:

"If bore in wheel must be increased more than ½ in. in diameter, then two roughing cuts must be taken."

Chairman of the Wheel Shop Committee was E. M. Spencer, wheel shop foreman on the Illinois Central.

How To Make Passenger Cars Ride Better

The most common maintenance faults leading to passenger discomfort involve wheel contour wear—double flanges, worn tread, and loss of proper service contour. Many railroads set mileage limits of permissible wear for wheel treads on certain types of trucks and cars. This extends the life of pedestal liners and box liners since the lateral disturbances are kept to a minimum.

Other roads set up limits of wear for the wheel treads and find this easier than constantly checking for mileage or time. The present developments and installations for re-contouring wheel treads without removal of the wheels from the trucks are becoming more and more the planning for the future. They will be instrumental in reducing car out of service time and keep cars in better riding condition.

The worn wheel tread condition is not the sole cause for lateral disturbances. A close check must also be made of truck clearances. These become more exaggerated as mileage builds up after the last complete truck overhaul. Permissible tolerances must be set up for pedestal liner wear and journal box liner wear which result in undesired lateral motion to the truck. These must be adhered to closely to have the truck as a unit respond to the track variations, as designed, and produce a good ride. Equalizer interference, also of major concern can be attributed in most cases to excessive clearances around the journal box and pedestal.

Truck responses are greatly affected by bolster and center plate motion with the former being greatly regulated by stabilizers and shock absorbers. Many types of controlling devices have been designed and installed to regulate the motion of the bolster and each must be checked carefully to be sure that the specified control is obtained. Center plate clearances and lubrication must be followed closely to see that body disturbances of both high and low frequency are not developed there.

Truck alignment is very important. The truck must stand at a uniform height from the track and have uniform clearances to allow it to operate at a uniform parallel distance with the track. Any variation that will prevent the truck from tracking properly will set up a very undesirable car body action. Main causes of misalignment are defective or improper springs, or improper vertical shimming to allow for variation of wheel diameters.

The proper tracking reaction of the modern truck is very critically controlled by the spring design and the various loads as calculated for both the bolster and equalizer springs. Most new designs are coil springs which require careful inspection and checking. The inspections must include such items as broken sections, wire working solid and interference between coils. At specified periods all springs should be tested in a test machine to see that each group carries its correct portion of the designed load.

The high frequency disturbances of a passenger carrying car are those referred to as noise or vibrations produced by defective auxiliary equipment. Many erroneous reports marked a car as bad riding, whereas the report should have stated undesirable noise or high frequency vibration. As such inaccurate reports are usually made by an employee unfamiliar with car maintenance problems, he should be quizzed further to get more precise data.

Instrumentation should be used to determine and index the riding performance of a passenger car. One way is to use a ride recorder and get a tape record of car performance (lateral and vertical) over track of known characteristics and consider this as the measuring stick of good road bed condition.

To determine the lateral index of the car a tape is ruled with lines. Motion is referred to as a disturbance of so many lines, with one pendulum for both right and left motion. Thus, a lateral acceleration that causes a deflection of 4 lines produces about twice the discomfort as that which causes a 2 line movement.

A similar scheme is used for rating vertical vibrations. Total numerical sums are then compared to tables and the car rated anywhere from very good to very poor, depending on the limits between which the sums fall vertical and lateral.

Experience has shown that indexing of these recording tapes requires some degree of judgment. For true lateral valuation, the work should be done on tangent track and the operator should make notes on the tape where car reaction is not as bad as the tape would indicate. It has also been found that the recording of the vertical vibrations is less accurate than the lateral and it may be desirable to reclassify the ride according to the judgment of the operator at the time of the test.

This is a report by a committee of which W. E. Symons, assistant general mechanical superintendent, New Haven, was chairman.

How To Be an Executive

"The mechanical officer is a versatile man, a sort of combined mechanical engineer, scientist, production expert and personnel manager—but we seldom find him in high executive positions," said W. M. Keller, executive vice-chairman and director of research, Mechanical Division, AAR, at a luncheon on Tuesday, September 13.

Selection of higher officers is on a fair and scientific basis within and outside the mechanical department. Yet, "as I have stressed, few mechanical men are in higher

W. M. KELLER

management positions. Therefore, we must agree that the reason must be within our own ranks. It is no serious reflection on one's ambitions to desire to avoid the crushing load carried by the modern executive. One has to be dedicated to the task to endure the constant drain on personal energy and the sacrifice of time which might otherwise be devoted to personal hobbies or pleasure.

"I do not believe we have in the past put enough emphasis on formal education. This does not mean that we are an uneducated group, but simply that any theoretical knowledge required for our jobs should be acquired before we encounter the task and not after. Education is now almost universally available in this country and with correspondence courses, night courses and Saturday classes available deficiencies in this regard can be readily, though not easily, corrected. Of course, we must study each new assignment and learn more as we grow with the job.

"We have a tendency to be provincialistic and overlook the importance of knowing what goes on in other departments. No one can have a complete working knowledge of maintenance of way, traffic, accounting, purchasing, etc., but we should have a constructive interest in the work of these departments. One can then understand better the corelation of the different departments and this helps us do a better job. We can learn about outside operations without being 'busy bodies' and raising questions as to the handling of the work of other departments. Our first task is to thoroughly understand our own department, then having secured this knowledge learn something of other departments."

Learn more about your railroad—how many locomotives, freight cars and passenger cars it operates and owns, Mr. Keller advised. Find out the number of freight car miles your company operates per year. How many miles of track does your railroad have? What is the expenditure relationship between engineering and mechanical departments? These figures are readily available from the trade magazines, governmental bureaus and the AAR.

"Study better means of expression and relationship in reporting to superior officers. It is understandable that we have a tendency to be nervous in reporting to superior officers, and this may merely show proper deference. It can, however, show lack of preparation in our work, which is a condition that must not exist.

No one who has had time to study an assignment should expect anything better than a bad time if he is unprepared when he reports to his superior. Weed out unnecessary or irrelevant statements in reports. Don't turn in the first draft of a report. Complete your report as soon as possible, and then read it objectively later and revise all parts that are not clear. After you read your statement on the typewritten page remember it is not like the holy writ. Rewrite as often as clarity requires. Remember, too, your superior officer is a busy man.

"Accept criticism cheerfully. Adverse criticism is usually made to be helpful. If, as an exception to the rule, it is based on a personality conflict, remember that hostility and bristling will not improve a bad situation. You have heard the expression that a person is too close to the trees to see the forest, but conversely a quick look at a forest may not reveal the trees. Try to find out what details in the trees would change the forest to desired proportions. Above all don't back away from a statement that is a fact. Your boss may question a statement to smoke out the details that your language left undisclosed. Don't worry about language if your superior decides to change it as long as the facts are left unimpaired. Be sure of the facts and then stand by them. There are dozens of ways to describe a situation in words. Which one is used is unimportant, but quality of workmanship is not served by withdrawing from a correct statement of fact.

"If you have plainly indicated the situation and recommend a certain course of action, cheerfully accept a different course than you have recommended. The boss may have policy reasons of which you are unaware for changing your recommendations, and he may not take time to explain them to you. There is a little statement printed for 'under the glass' desk use which says—'The Boss may not always be right, but he is always the Boss.' and I think that describes a condition we occasionally forget.

"Please remember that in my remarks I am not suggesting that mechanical officers have grounds for complaint. We will move into the executive level as soon as we demonstrate we are capable of handling the assignments involved. A few mechanical people have gone to the top. There is no prejudice on the part of management against mechanical people moving out of mechanical departments. If we are to move out in greater force, I believe we need counseling. My counsel to you is to give serious thought and consideration to this situation if you are ambitious for higher management positions. The future is alive with possibilities, so start now and success will be yours."

Record Attendance at LMOA Sessions

Eight reports on mechanical, electrical and boiler subjects plus two addresses hold maintenance mens' interest

F. D. Sineath, President

C. M. Lipscomb, Sec.,-Treas.

Once again, well over 800 members and guests registered for the annual meeting of the Locomotive Maintenance Officers' Association in the Grand Ballroom of the Hotel Sherman which this year included a group from the former Master Boiler Makers' Association. Of the five sessions (Tuesday afternoon being set aside for members of all associations to view the exhibits of the Allied Railway Supply Association) four were given over to the mechanical and electrical reports and the fifth session to two technical reports prepared by a committee of the Boiler Makers' group.

The mechanical reports had to do with the Overhaul of Power Assemblies and Bearings; Reclamation of Diesel Parts; Shop Planning for Maximum Use of Existing Facilities and Axle, Wheel and Truck Maintenance. The Shop Planning report appeared in the October *Railway Locomotives and Cars;* the parts reclamation report elsewhere in this issue and the remaining two mechanical reports will be dealt with in detail in other issues.

Of the two electrical reports, one which dealt with "A Positive Electrical Diesel Maintenance Program" was published in the October issue, page 62. The other was on the subject of the "Control of Electrical Delays and Ground Relays."

The association's annual meeting this year was favored with two addresses, one by the Hon. Owen Clarke, ICC Commissioner, who spoke on the relation of maintenance problems to safety of operation, and another by A. K. Galloway, retired general superintendent motive power and equipment, Baltimore & Ohio and a member of the LMOA Advisory Board. Both of these addresses appear, in abstract form, in these pages.

The officers, members of the executive committee and members of the Advisory Board for the year 1955-1956 appear, with those of the associations. on page 66.

Conditioning Package Boilers and Steam Generators

Extensive dieselization is in the process of making what we know as the stationary power plant at various terminals an obsolete piece of equipment. These plants are becoming outmoded because they are labor-wise uneconomical, expensive to maintain, fuel costs are high and generally much too large for the lowered steam demand and oil and gas eliminate costly coal and ash handling.

New buildings with modern radiation, smaller buildings to house the motive power due to greater availability of the diesel power, elimination of boiler washing plants with necessary pumps and less locomotive washing accounts in part for the lowered steam demand and consumption.

The railroads are now following the trend of industrial establishments and manufacturing plants in demanding and purchasing completely packaged steam generating units. The steam generators are manufactured as complete units and they include all controls and safety devices. Engineering costs are negligible and the installation costs are low as it is only necessary to connect to fuel, steam, electric and water lines and to a stack outlet.

Since all mechanical equipment will cause trouble and create difficulties when not properly handled, the package boiler is no exception. Adequate supervision is necessary even though they are designed to be automatic or semi-automatic. Adequate service facilities, proper feedwater treatment with a deaerating heater, fuel oil additives, steam treatment for return line corrosion prevention and preventive maintenance must be given serious consideration.

The common characteristic of all types of package boilers is their ability to produce large amounts of steam within comparatively small dimensions. They also contain a relatively small amount of water in relation to that which is evaporated each hour of operation. For this reason the heat transfer surfaces in both the water and fire side must be kept absolutely clean and be free from scale and soot.

The package type boilers usually fall into two classes: the modified Scotch type

with firetubes and the water tube type with one or more drums. The Scotch type with multiple passes range in size from 15 to 600 hp and may be equipped with or without a wet back. The smaller sizes have a plain combustion chamber, the larger sizes have a corrugated furnace to give freedom for expansion while still maintaining the necessary rigidity. Proper baffling conducts the hot gases through the design gas passages.

The water tube steam generators are of a later design, are made in about the same capacities as the fire tube type, but can be manufactured for higher pressure. This feature is of doubtful value for shop steam. Many different types are available from a simple two drum to the more complicated types with multiple drums and water wall headers. The boiler is contained in an insulated steel jacket and may be installed either indoors or outdoors. The large number of bare water wall tubes is responsible for the efficient furnace wall cooling and absorption of the radiant heat.

When contemplating the installation of a package boiler an exhaustive study should be made of the water requirements and the type of treatment. Basically the mechanism of scale formation in both the fire tube and water tube types is fundamentally identical. Silicate scale, sulfate scale and carbonate scale impede heat transfer in the mentioned order. They must not be present and when once formed and deposited, they are very difficult to remove from either the small tubes or flues and the corrugated furnace of the firetube boiler.

(*Continued on page 59*)

Changed Practices Can't Reduce Safety

Owen F. Clarke

Responsible railroad officers have a "definite obligation" to make certain that new practices adopted for operating economies do not adversely affect the safety of the traveling public and railroad operating personnel.

This view, expressed by ICC Commissioner Owen Clarke, highlighted an address before the LMOA.

"Regulation should never hamper improvements in transportation that will increase efficiency and advance the public interest," the commissioner said.

"However," he added, "the desire to progress is not a license to cut corners of safety."

Mr. Clarke said the ICC is not ultraconservative, but its responsibilities "are too great to permit us to acquiesce in, or condone, the use of equipment that would reduce the degree of safety now afforded."

The ICC's Duty

"It is our duty to see that operating changes do not result in neglect of necessary inspections and tests; that no locomotive or unit is dispatched which has not been properly tested and in a safe and suitable condition for service," the commissioner said.

"Locomotive safety, we believe, should receive the same serious thought and attention that anticipated cost reductions receive when operating changes are contemplated."

"This is particularly true," the commissioner went on, "with respect to casualties caused by falls in and about diesel units. Some railroads have made progress on this kind of "poor housekeeping," he said, but he asked that LMOA members continue to give the subject careful attention.

Turning to the ICC's rules for locomotive inspection, Mr. Clarke said rules for inspecting and testing locomotives "other than steam" are now being reviewed by the commission.

"It is not anticipated," he said, "that any of the proposed changes will impose additional burdens upon the mechanical forces."

Discussing locomotive safety programs, the commissioner said realistic evaluation of such programs "ought to be on the basis of accidents prevented, rather than on accidents reported."

Commissioner Clarke commented, also, on the ICC's streamlining work of the past two years. One result has been the consolidation of the former separate bureaus of Locomotive Inspection, Safety and Car Service.

"I am happy to report that through our new bureau, the business of the railroads with the commission in those fields has been substantially expedited," he said.

"We are hopeful," he added, "that still other advantages will flow from this consolidation which will be beneficial to the public, the railroads and the ICC."

A Look At Safety

Commissioner Clarke told LMOA members that a "definite relationship" exists between locomotive safety, performance and operating costs.

"Basically," he said, "a well-maintained locomotive is a safe locomotive, as well as economical and efficient to operate."

An effective preventive maintenance program can reduce the all-important repair and maintenance costs, he added.

"Frequently in accident investigations, we find a history of repeated reports covering the same defective condition," he continued. And, he said, the ultimate cost is often many times that which would have corrected the basic defects.

There are many methods of treating the feedwater supply and mode of treatment is dictated by the composition of the raw water supply and the amount of condensate return. To list a few of the choices:

External Treatment

1. Lime-soda-aluminate, hot or cold process.
2. Lime-soda-phosphate, hot process.
3. Lime-Zeolite.
4. Sodium Zeolite.
5. Sodium Zeolite—Dealkalization.
6. Demineralization.

Internal Treatment

1. Soda ash, caustic soda or alkaline salts.
2. Phosphates.
3. Various combinations of alkaline sodium salts with suitable types of organic compounds.

The boiler water must be maintained at zero hardness and it is therefore imperative that an aftertreatment be added to the boiler where external treatment is used. The post treatment should consist of phosphates and organics to remove the last traces of hardness and assist in fluidizing the small amount of residual sludge causing it to be non-adherent, also the organic should preferably be a type that will be an oxygen scavenger. Catalyzed sodium sulphite or hydrazine will also accomplish the same purpose. To assure a good quality steam with no foaming, the post treatment should include one of the new type antifoam chemicals. The post treatment should be added directly to the boiler drum, preferably at a constant rate or at intervals frequent enough to assure ample chemical is present at all times,

Continued on page 60

Galloway Charts Path

A. K. Galloway

A. K. Galloway, an Advisory Board member of LMOA, had praise of the past and advice for the future when he spoke before that organization.

"Members of the Locomotive Maintenance Officers' Association, with their combination of ideas, facts and figures, have been a motivating factor in the development of better diesel locomotives . . . this organization is invaluable to railroad supervisory personnel as well as to the railroads themselves," Mr. Galloway declared.

Mr. Galloway, retired general superintendent motive power, B&O, was presented an honorary life membership in LMOA.

Looking to the future Mr. Galloway said:

"The LMOA can play an extremely important part in assisting railroads achieve desired improvements, but I feel some change in policy would be required. . . .

"This can be brought about through more specific handling and detail on one individual problem, rather than the broad coverage given our general topics which have been handled in the past. General topics should not be dropped entirely . . . but more time must be given to detail and solution of individual problems. . . .

"I would encourage the formation of committees from individual railroads to meet for practical discussion at not less than 3-month periods. . . .

"Coordination of such committees through this organization would result in much more specific information from which railroads would derive an even greater benefit from many of the general topics as are being discussed at this convention.

"I feel that this organization should have the backing of every railroad on an official basis, and that membership in LMOA should be encouraged officially in every way possible."

Mr. Galloway went on to say he is not suggesting that LMOA needs reorganization, or that topics presently being handled are not being well covered and well presented.

"However," he added, "I am certain more detail handling of specific problems, being given a portion of committees' time, would be of considerably more benefit to the railroads."

Tracing the Past

Elsewhere in his remarks, Mr. Galloway traced the changed thinking that grew out of the transition from steam to diesel power.

"Old ideas, deep rooted in steam locomotive tradition have to be reviewed, re-evaluated and changed or completely discarded," he said.

New and converted locomotive shops were designed and equipped to provide the most economical and efficient means of repairing diesel locomotives with minimum loss of availability, he added. Many primary ideas about diesel shops had to be changed, but the final product has, in most cases, been shops which are adequate for diesel repairs.

As the power trend continued, tools and machinery for repairs presented another problem, Mr. Galloway continued. Every possible use was made of existing machines, and it was necessary to recondition older machines so they would operate at the closer tolerances required.

"Many new tools were developed and placed in service, and workers in the shops made many contributions," he said.

remembering the boiler water volume is small in comparison to the steam output. The chemical additive is only as effective as it is proportioned.

Internal treatment likewise requires proper proportioning equipment that will give satisfactory results and conserve chemicals. The chemicals should be fed directly into the boiler drum and added continuously. The tannin and processed lignin will peptize the precipitated calcium and magnesium salts and make them readily removable by the blowdown. Their effect is at times unpredictable as the dosage is affected by the composition of the raw water. Proper dosage for best results is determined by experiment.

Regardless of the type of water treatment used, blowdown is of serious import. With external treatment the reduction of dissolved solids is accomplished. With internal treatment the blowdown reduces the sludge concentration. The amount of blowdown is governed by load on the boiler and the permissible total solids content. A continuous blowdown results in more uniformity in the concentration of the solids and therefore a better quality steam. The hand blowoff cocks should also be used in conjunction to remove the sludge that settles in the locations where circulation is low and to keep them in operating condition. This is especially important with water wall headers.

Simple control tests of the treatment and blowdown should be made by the operator at least daily, then inspections and tests should be made at regular intervals by a trained water treatment chemist. This type of control program will assure trouble-free operation.

Condensed steam has a low pH, the acidity being due to dissolved carbon dioxide evolved from the boiler from decomposition of various salts. The gas is mixed with the steam and is carried to all parts of the system, there to disolve in the condensate and attack the return piping and appurtenances. The corrosion can be prevented by treating the steam with amine compounds. Neutralizing amines react with the carbon dioxide to form amine carbonate and in the process raise the pH to neutrality or above, depending upon the amount proportioned into the steam. The morpholine type is recommended where the return percentage is high, roughly 50 per cent or more. The morpholine return to the boiler with the condensate and distills out with steam to continue its neutralizing effect. Filming amines form a non-wettable monomolecular film over the surfaces of the steel to protect it from aggression by either carbon dioxide or oxygen. It is necessary to feed filming amines into the saturated steam main continuously because the thin film erodes from metal. It should not be fed into the boiler or into superheated steam mains. The control for both of these compounds is accomplished by observing test nipples installed in various points of the return piping.

Fuel oil combustion additives are very desirable to prevent soot formation on the tubes and more especially at the inaccessible places where the soot blowers are not effective. These compounds lower the ignition temperature of the carbon deposits causing them to burn off rather than accumulate. Soot deposits attract moisture when the boilers are idle. The sulfur from the burned fuel along with the moisture will cause serious corrosion on the fireside. It is necessary that the fireside be kept clean as the higher the sulfur content of the fuel and the greater the humidity, the more severe the corrosion. Severe fireside corrosion which can penetrate the tubes can also be caused by the formation of calcium, sodium or vanadium acid sulfates, these being products of combustion which, mixed with soot or carbon, form an adherent scale. These too are minimized by combustion additives.

Prevention of the deposits on the heat transfer surfaces of steam generators can only be accomplished by adequate supervision and testing by trained personnel. This detail is necessary in order to realize economical, reliable, trouble-free and efficient operation.

This report was submitted by the Boilermakers' Section Committee of which H. M. Schudlich, engineer water service, Northern Pacific, was chairman.

Fix, Have Fixed Or Buy New?

Management, aware of the high cost of diesel locomotive replacement parts and knowing that substantial savings can be effected by the proper reclamation or repair of used parts, is faced with the task of determining what parts can be repaired or reclaimed at a saving, and what parts should be redesigned for greater serviceability. This is the problem approached by the Diesel Material Reconditioning and Control Committee in a report entitled, "Repair and Reclamation of Diesel Parts in Railroad Shops."

Reclamation and repair work, the report states, should be divided into light and heavy classes. Light work can be handled with little equipment at minimum cost at any shop. Heavy repair and reclamation should be handled at centralized railroad shops or by outside concerns as they require equipment, procedures and techniques not found in small shops.

Selection of a heavy work site must consider availability of needed machinery and skilled workers, a central lication and the maintaining of minimum stock.

For light repairs it is essential that the assignment of this work be accompanied by the proper instructions on what to do and how to do it.

Selection of those parts to be reclaimed necessitates comparing the cost and service life of a restored part with that of a new part. Test set ups must be made for this purpose. The packaging of parts to be shipped to and from a repair point must be studied and the costs determined. This includes possible damage in shipment. Proper identification for the stores department must be included.

Care must be taken to see that the cost and extent of reporting expenses involved in the restoration of parts does not become so involved that it is a burden on the accounting department and thus causes a substantial decrease in reportable savings.

Cost of tools and machines must be given careful consideration as the expense involved may eliminate any future saving to be gained from the restored part. Adaptation of present machines must therefore also be considered.

The major part of the report adapts these principles to the repair of specific parts such as radiators, oil coolers, valve seat inserts, pedestal liners, etc., and with such practices as welding and metal spray. It also deals with items which should be handled by outside shops. The full value of the report requires detailed study.

Fuel Again a Theme at RF&TEA

Open discussion discloses problems which need study. Performance of steam- and gas-turbine locomotives reviewed.

L. H. Peters, Sec.-Treas.

W. H. Fortney, President

In a discussion of fuel losses at locomotive filling stations, the Railway Fuel and Traveling Engineers' Association returned to the consideration of fuel economy during the annual meeting held at hotel Sherman, Chicago, on September 12 to 14, 1955, for the first time since the problem of coal conservation ceased to command attention. There were 9 other papers and committee reports, a question-and-answer panel and three addresses on the program, which comprised five half-day sessions. The question-and-answer panel was conducted by R. D. Nicholson, general road foreman of engines and supervisor of air-brake equipment, New York, New Haven & Hartford. The panel comprised A. A. Michels, Electro Motive Division, General Motors Corporation; E. S. Phillips, Fairbanks Morse & Co.; W. A. Powers, American Locomotive Company, and W. B. Thornton, Baldwin-Lima-Hamilton Corporation. A case study of the causes and remedies of diesel failures was presented by a committee of which R. R. Rich, road foreman of engines of the Chicago, Rock Island & Pacific was chairman. Another committee, of which R. H. Francis, general road foreman of engines, St. Louis-San Francisco, was chairman, dealt with trouble shooting on Vapor-Clarkson steam gemerators. At a joint session of the Air Brake Association and the Railway Fuel and Traveling Engineers Association papers were presented on Air Brake Troubles in Cold Weather, contributed by the Montreal Air Brake Club, and Recent Developments in Air Brake Control, contributed by Westinghouse Air Brake Company. This session was completed with an open discussion on freight train handling.

A paper on Possibilities of Burning Lower Cost Diesel Fuels and Effect of Their Use was presented by Ray McBrian, engineer of standards and research, Denver & Rio Grande Western. Summaries of addresses, the fuel waste discussion, and other papers appear below. The president, W. H. Fortney, district road foreman, New York Central, in opening the meeting, spoke briefly of the opportunities before the meeting, after the lapse of 1954.

Progress a General Responsibility

Responsibility for future progress in the railroad industry is not a job for management alone, but is the duty of "every man on the payroll." So said D. A. Fawcett, vice-president, New York Central in opening his address at the first session of the meeting.

"We are railroading in a great era," Mr. Fawcett declared. He referred to the growing use of electronics, and called Centralized Traffic Control a "great factor" in the industry. By installing CTC between Cleveland and Buffalo, the Central is eliminating two main tracks, Mr. Fawcett said. The two remaining tracks will handle the same amount of traffic as the four did, and with even greater efficiency.

Mr. Fawcett went on to predict "more progress ahead" for railroad motive power. This may include, he said, the use of turbines and, eventually, atomic power.

Turning to a matter "somewhat afield from your meeting here today," he called attention to the need for all-out railroad support or President Eisenhower's cabinet committee report on transportation.

"Acquaint yourselves with the features of this report, and the pending legislation, and let your representatives in Congress know of your position," Mr. Fawcett urged.

"Powerful lobbies are lined up against us, financed by other forms of transportation, and we must use every tool in our command," he declared.

Handle Cars Carefully

To achieve careful car handling, it is most important that men on the ground who handle cars be made fully aware of the factors involved, said C. A. Naffziger, director, AAR Loss and Damage Prevention Section, in his address during the opening session. This year 'round job is now being done by railroads, shippers and the AAR. One of the major factors of careful car handling is that of reducing damage due to overspeed impact. Estimates are that over 50 per cent of the damage to lading and cars is from this cause. A brighter side of this picture is that freight claim payments for the first five months of 1955 are 9.3 per cent below the comparable period of 1954.

Two hundred railroads own and operate over 2,200 impact registers, he said. In addition to these registers, many railroads hold clinic and instruction periods in yards, offices and terminals for train and yard crews, to acquaint them with freight loss and damage due to overspeed impact. Use is made of charts, drawings, photographs, lectures, motion pictures and "fish-bowl" cars showing lading and impact registers.

The various Shippers Advisory Boards have special committees concerned with careful car handling and freight loss and damage. October has been designated as careful car handling month, he said. Railroads and shippers have held seminars at the AAR's laboratory in Chicago, and more are scheduled in the future.

"It's Time to Talk"

Legislation now in Congress to liberalize the regulation of common carriers "should have the support of every railroad man in America," said W. T. Rice, president of the Richmond, Fredericksburg & Potomac. The railroads today have a "great story to tell," he said.

This story includes the fact that "we pay our own way." The land-grant story itself is something we can be proud of—8% of the railroads paid back to the government more than 9 times the value of the land granted, he added.

The Weeks' Report, on which the proposed legislation is based, has the support of many people outside the railroad industry, he said. Legislation embodying most of the report's recommendations has since been introduced in Congress.

Mr. Rice pointed out that this legislation would provide common carriers with new freedom of rate making. Among other things it would restrict the ICC's power of suspension, and empower the ICC to override state commissions in abandonment-of-service cases.

"At no time in our lives has there been so vital a matter before the railroads," Mr. Rice declared.

"Make friends with your patrons," he urged. "See that they know of this legislation; and that they know and understand the railroad story."

Mr. Rice cited the existence of "new methods, new tools and new equipment" as evidence of positive thinking on the railroads. "With these," he declared, "the industry can never go stale."

Waste of Fuel at Locomotive Service Stations

A general discussion on the subject of fuel waste which takes place when locomotive fuel tanks are filled was led by T. J. Conway, transportation assistant, Texas & Pacific. The discussion was participated in by representatives of many roads, all of whom were of the opinion that the amount of fuel being wasted is substantial and that the loss needs to be checked.

Most of the fuel is spilled when the filling hose is disconnected from the locomotive. The loss is partially in the form of dribbles from the hose nozzle and partially a flow-back from the horizontal filler pipe on the locomotive. A change in this pipe was suggested. Some control can be exercised over these losses at small refueling points, but the point was stressed by several speakers that this is very difficult at large stations, particularly where passenger locomotives are fueled. Here theurge to complete the job and get the train on its way leaves no time for the exercise of care to avoid overflowing the tank.

Aside from the loss of fuel—which one speaker said had been measured by collecting the spillage in a sump on one railroad and amounted to 30,000 gal a month at a large point—there is the fire risk arising from ground at filling stations becoming saturated with oil.

Few remedies were offered. At the small points on the New York Central a cart about 4 ft long has been made which is wheeled to the unit being fueled and placed to catch the flow back when the hose is removed. The oil is put back through a connection provided for that purpose. These carts are used only at small points where there is no pressure for time in fueling the locomotives. The Baltimore & Ohio has adopted a similar scheme in the form of cans with wide funnel openings.

Improvements have been made in the hose leakage by the use of different end valves. Some of the trouble here comes from injury suffered by the hoze nozzle from rough handling which destroys the tightness of the valve. The Pennsylvania has vent alarms on some of its locomotives, which are said to be successful in preventing overflowing the tank.

It was suggested that the overhead hose connections should be changed to a connection such that the hose nozzle would be above the connection so that the oil remaining in it after the locomotive has been fueled would drain back into the tank.

One speaker thought that supervision of refueling should prevent waste of fuel. Another agreed that supervision had its place, but that it would be better to provide the men who do the refueling with proper tools to work with—something in the nature of an adequate warning before the tank becomes full.

Another suggestion was that something might be developed similar to the automatic shut-off which stops the gasoline pump when the tank is full in automobile service stations.

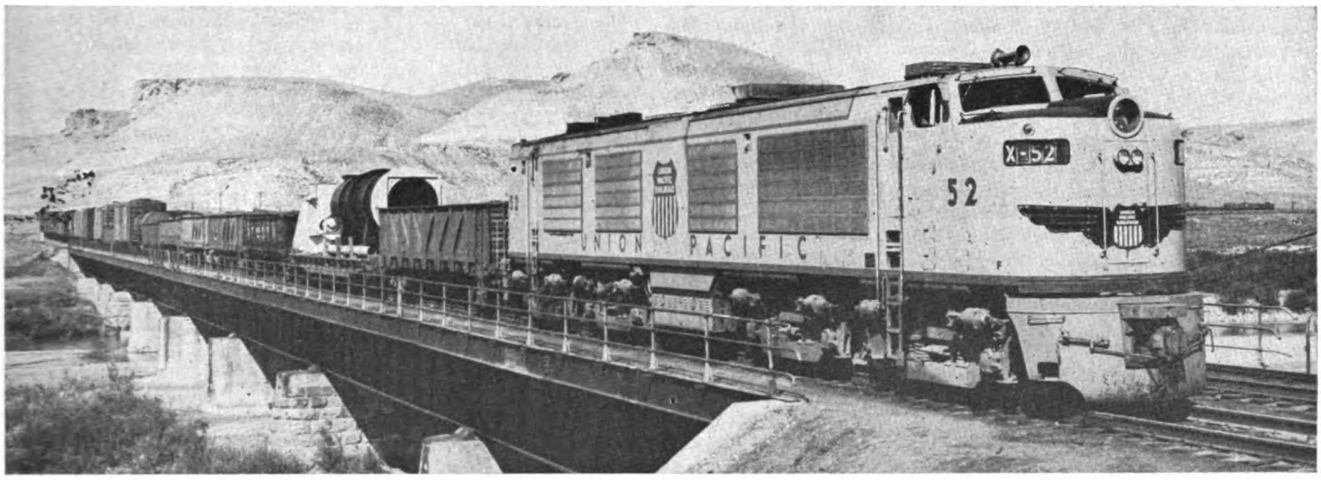
UP Gas-Turbines Are Smooth Operators

C. Shipman,
Road Foreman of Engines,
UNION PACIFIC

(Mr. Shipman opened his paper with a brief description of these locomotives. The turbine is rated at 4,500 hp for traction. The locomotives are geared for a top speed of 65 mph. Starting tractive force is 137,930 lb, based on 25 per cent adhesion, and maximum continuous tractive force is 130,000 lb at 10 mph.* He continued as follows.)

The turbine is started by a four-position switch in the cab. From Position 1 to Position 2 starts to crank the turbine with the diesel engine. Position 3 transfers the turbine from the diesel to Bunker C fuel.

* For a description of the first of these locomotives, see *Railway Mechanical Engineer* for July, 1949, page 363.



Position 4 shuts off the diesel and hooks up the turbine ready to move the locomotive. From here on control is through relays.

Average fuel consumption of the turbine is approximately 350 gallons per hour. Since the turbine idles at a speed approximately 5,200 rpm (full-load speed is 6,900 rmp), it will be seen that idling time must be held to the minimum to avoid waste of fuel. That is why we can shut the turbine down on descending grades and use the auxiliary diesel engine to maintain air and to supply field current for the dynamic brakes, which is a great savings in fuel.

These gas turbines are all equipped with automatic transition and have a throttle with 20 notches. Due to bad rail conditions at times over the district on which the turbines operate, there is a reduced-power switch in the cab of the locomotive. When rail conditions are bad we can reduce the power of the lead pair of wheels by placing this switch in reduced-power position, which will take about 250 hp off of the two lead pairs of truck wheels. This switch can be reduced or put into full power with the throttle in any position without any damage to any equipment.

On ruling grades over the territory where the turbines now operate, the turbine with 5,000 tons will handle the train 3 to 4 mph faster, and 6 to 8 mph faster on a level track.

Engine crews will tell you that with the present turbine throttle with 20 notches they can start a train easier and smoother than with any other power that we have. We very seldom have any train break-in-two's with turbine power and this, no doubt, is due to having all of our power in one unit and 20 notches on the throttle so that we can control it much more uniformly.

Where drifting downgrade with trains we have very little trouble with run-ins and run-outs. No doubt, this advantage is gained from having all of our weight on one power unit.

One of the most discussed and most misunderstood features of the gas turbines is the exhaust and noise that they make from final exhaust. Actually, at full speed, there is not as much noise in the cab of the turbine locomotive as there is on a 16-cylinder diesel unit and it is very easy for crews to converse in the cab of the turbine at all times. Engine crews will tell you that they would rather have the turbines than any other power we have operating because they are easily handled and that they will get over the road much faster than the other class power we have.

Discussion

The following information was developed in response to questions asked after Mr. Shipman had presented his paper:

Propane is a satisfactory fuel for the turbine locomotive. Its experimental use on one locomotive has not been extended, however, because the cost of providing the equipment to handle the fuel over the entire line over which these locomotives operate would have been prohibitive. The fuel now used is called Bunker M by the refineries. The Bunker C fuel, which the road formerly used, was washed and strained by the road, removing the soda ash. This is now done at the refineries and the fuel as marketed renamed.

Trouble was experienced in operating through tunnels from the exhaust gasses getting into the air intake to the compressor. This has been improved by adopting a 60-deg exhaust stack which has served to keep the gasses away from the air intake at an expense of a 5% power loss. When operating at 15 mph there is no trouble of this kind with the turbine, but the lube oil will sometimes get hot and operate the lube oil shut down when the speed drops below 5 mph. When this happens the fuel pipes are cleared of Bunker C oil in a purging cycle with distillate. It sometimes takes 30 to 40 mins before turbine can be started again.

The throttle on the early locomotives increased the engine speed gradually until it reached full load speed at the thirteenth notch. On the later locomotives, with the transition lever in the No. 1 position, the turbine is brought up to speed and the throttle only controls the excitation to the generators. This gives a finely graduated start. There are four transitions. The throttle must be in the 20th notch before the motors can be shunted.

The locomotives operate between Ogden, Utah, and Cheyenne, Wyoming, a distance of 500 miles. They usually run through without being taken off the train. When one is cut off and sent to the roundhouse at a terminal, if there is no electrical trouble or other equipment broken down, it can be back on the train in 45 min. No maintenance men are traveling with these units.

The only place where the unit is noisy is on the ground alongside the turbine.

No move has been made to use these locomotives on passenger trains. The steam generator, used to heat the fuel oil, is not of sufficient capacity to heat a passenger train.

Pennsylvania School for Engineers

In 1946 a number of locomotive firemen returning from military service had to take examinations for their promotion as outlined in the working agreement (1-B-1 and 1-B-2). A fireman had 30 days to prepare himself and pass examinations in air brakes, steam locomotive machinery, electric locomotives and rules. This was a big undertaking. The general chairman of the Brotherhood of Locomotive Firemen and Enginemen, W. B. Woodward, Jr., in conjunction with H. L. Nancarrow, then General Manager of the Eastern Region of the Pennsylvania, met with Colonel N. Nathanson, Director of Veterans Education, and Dr. W. E. Brunton, Director of Vocational

Education. The Pennsylvania Railroad Instruction School was opened on January 6, 1947, as a G. I. school under the direction of the Veterans Administration, the Bok Vocational School and the Pennsylvania.

Non-G. I.s in great numbers applied for admission and six months later it became an open school for all men of all crafts in the railroad field. Men from other railroads also asked permission to enter the school and were given permission to attend these classes.

Attendance since January 6, 1947, to January 6, 1955, has been 59,639. Students attend on their own time after working hours, on their days off, etc. Several men who live at a distance from the school have come to Philadelphia and lived at the Y. M. C. A. for as high as two weeks at a time on their own expense, to prepare themselves for their examinations. The teaching staff is made up of men who know their subjects and have the ability and the personality for instructing a course in diesel locomotives, electric, air brakes and rules.

Admittance to classes is by application, filled out by those interested and placed on file. Classes are called by the date of the application, so that no partiality is shown.

Classes are arranged to suit the students and the hours they are working. They attend two classes a week, two hours a day. An extra half hour added on to the two hours causes the student to become tired and he gains little and will lose a lot of what he has received in the two hours he has already attended.

Friday is an open day where the students who have been forced to miss classes during the week, due to sickness, vacations and working conditions, may come in and catch up. It is also a day set apart for special training by appointment only.

During regular classes instructors never ask an individual student a question, though we do ask questions of the class group. The reason for this is that many students become stage frightened and cannot answer, though they may know the answer to the question asked. This becomes an embarrassment to them and many times they do not return to classes. But the students are encouraged to ask questions on the subject being taught at the time.

All subjects are thoroughly taught. In air brakes, for instance, there will be men from all crafts, from laborer to supervisor. We try to have only 15 students to a class. These students are asked to bring with them a loose-leaf note book, and a box of water-colored pencils with which they color the flow of air, part by part. When the course is completed, which takes about 3½ to 4 months, the student will have a complete set of colored charts, which starts at the compressor and covers every type of locomotive and car valve.

Large wall charts are used in teaching, of which we have 146 in our course on Air Brakes along with 93 air-brake parts, which the students take apart and reassemble.

At the completion of the course a certificate is given each student. We have also found that the school has created a wonderful human relationship. Invitations are sent out from our student file inviting them and their families to take part in commencement exercises. No classes are held this day but instead we have open house from 9:00 am to 9:00 pm. Coffee and cake are served throughout the entire day and door prizes are given out in the evening.

We give five book prizes for the best kept note books. This creates an interest in the students keeping a neat note book during the course.

In the evening we have a special program with several representatives of management, labor and school boards present, who assist in giving out certificates to outstanding students of each class for that year. These students are picked, not only by the instructors but by the student body also.

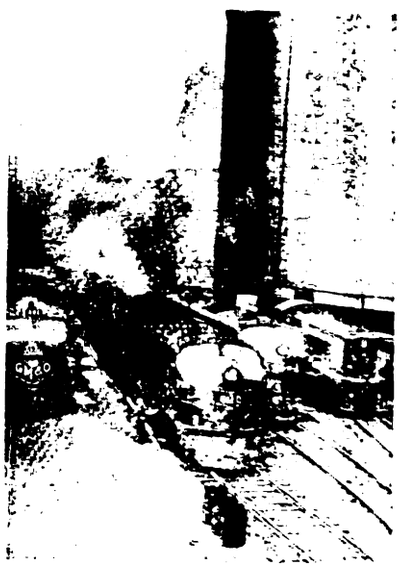
The school has more than paid for itself through the knowledge of its employees. (Of course this does not show on paper.) One illustration—A laborer had just completed his speed-control course. He was working at an engine storage yard, when a locomotive had an operation of speed control. The employees on this locomotive, not knowing what to do, called for assistance. Many tried to help. It was the laborer who knew and went out and was able to clear it up, thus saving a passenger detention..

Before closing the second part of this paper let me give you a few good hints which have made, and will make, a successful school. Let us call them the ten commandments of a Successful School. In the training of locomotive personnel—

1. Pick out a good, desirable location where it is centralized for students to attend. Ours is in 30th Street Station, handy for men riding to and from classes by train.
2. Pick a good size room with plenty of light and ventilation, clean, attractive and inviting to those attending. Arrange your work tables in the form of a horse shoe so the instructors may work around and with each student.
3. Have plenty of working equipment around the room. In the front of the classes have a work table where the equipment may be taken apart.
4. Pick a person for instructor who has personality, patience and ability plus —who knows his subject and how to present it.
5. Never talk, or let be talked, religion, politics or union regulations in the classroom. Have this understood at the very beginning of the class.
6. If a student is absent find out why. If he is sick send him a get-well card which has been signed by his associates. It will do a lot, not only for him, but for those sending.
7. Do not allow arguments in a class. They create hard feelings and never work out for the good of the class.
8. Work hard with those who may not grasp as fast as others, but be careful not to show any partiality.
9. If you are teaching air brakes do not let a student question you on the diesel or electric course. After class it is all right but not during the class.
10. Have an instructor for each subject, with separate classes.

My dream of the future is a universal railroad school which will cover all railroads over the entire United States, with little or no cost to the individual railroad itself. How, you may ask, can this be done?

1. By having schools located at terminal points over the entire United States, open to all railroads. To these schools would come the men and women employed by the railroads who live near these cities and are seeking education in this field.
2. The schools could be sponsored by the unions, through their general chairmen, local chairmen and stewards; by railroad management of the different railroads and by the State Board of Education.
3. The center of the Railroad Board of Education could be the A. A. R. at Washington, D. C.
4. The instructors would be carefully picked local men from different railroads, well trained in the subject to be taught.
5. The curriculum would consist of courses in air brakes, diesels, operating rules and signals, Pullman porter and dining service, police, car movements and tracing, etc.
6. Who would pay for this program? The School Boards. For the railroads pay out millions of dollars per year school taxes and derive not one cent back for its output. In other words, it would be vocational education, with schools on railroad property.



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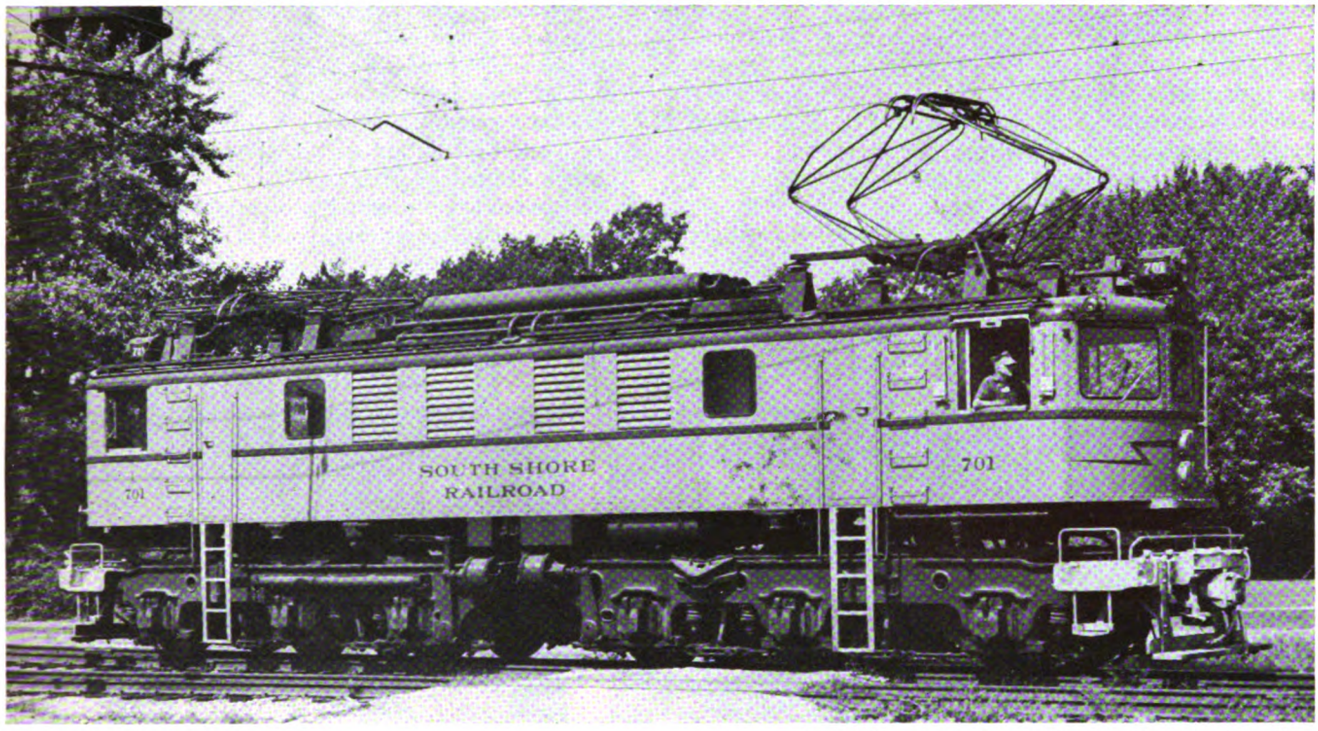
REGISTRATION AT SEPTEMBER 1955 COORDINATED MECHANICAL MEETINGS

Association	Sunday, Sept. 11	Monday, Sept. 12	Tuesday, Sept. 13	Wednesday, Sept. 15	Total 1955	Total 1953
Air brake	41	85	34	9	169	192
Car Department Officers	80	221	92	40	433	520
Locomotive Maintenance Officers	89	466	134	28	717	950
Railway Fuel and Traveling Engineers	91	120	28	28	267	322
Railroad Total	301	892	288	105	1,586	2,156*
Railroad guests	8	9	93	—	110	—
Allied Railway Supply	638	697	146	41	1,522	869
Grand total	947	1,598	527	146	3,218	3,025

*Includes 172 members Master Boiler Makers Association.



One of the converted locomotives as it appears in service.

South Shore Is Rebuilding Ten NYC Electrics

By M. Aldrich
Master Mechanic
Chicago, South Shore & South Bend

In December 1954, the Chicago, South Shore and South Bend purchased two New York Central type R-2 electric locomotives formerly used in freight service on the Harmon Division. The South Shore also secured an option to purchase eight additional units depending on the performance of the first two after conversion from 600- to 1,500-volt operation.

The first locomotive was converted by railroad shop forces, placed in service in June, 1955, and the option for the purchase of the eight additional was exercised. This order was placed in August, 1955 and delivery is being awaited.

As these locomotives are converted the 85- and 100-ton locomotives now in service on the South Shore, will be retired and disposed of.

One converted R-2 locomotive will be equivalent to two 85- or 100-ton locomotives which are operated in pairs. Therefore, 8 will be a replacement for 12, 85-ton locomotives and 4, 100-ton locomotives, with the other 2 being additional motive power.

Use of the converted locomotives will result in lower operating and maintenance cost as the number of units will be cut in half, and since they have C + C wheel arrangement, are more suitable for road service than are the present B — B units.

The conversion of the locomotives for service at 1,500 volts d-c operation involves the following basic changes:

Traction motors are reconnected, two permanently in series. They are rated 750 volts and insulated for 1,500 volts to ground.

Accelerating and motor combination contactors are reconnected for motor combinations of six in series, three in series, and two in series.

Accelerating grids are replaced and reconnected to adjust for reduced locomotive current due to series con-

nection of traction motors. Six hundred-volt air compressors and blowers are replaced with 1,500-volt machines.

Controllers and control circuits are remodeled so as to give series, series-parallel and parallel operation of traction motors instead of series-parallel and parallel operation as used on 600-volt operation.

A motor-generator set is installed for battery charging, lights and control, instead of series charging from the ground side of the heaters or blowers. Pantographs for overhead current collection are installed to replace third rail current collecting equipment.

Large sealed-in windows are installed in ends of cabs which replace clear vision windows, thus giving increased comfort and vision to the operator.

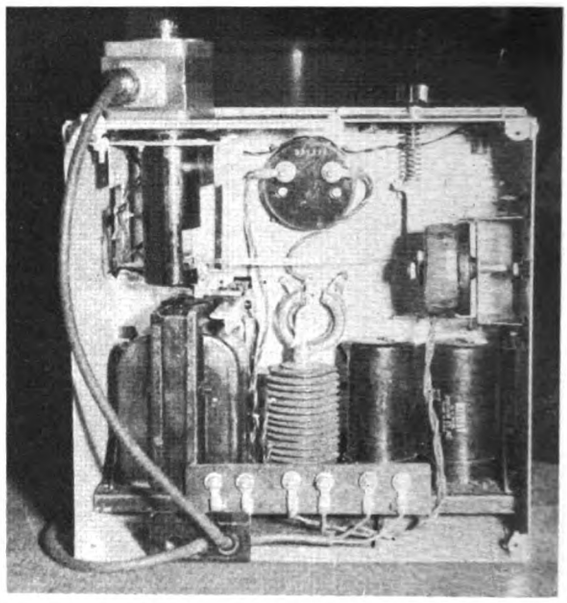
Side entrance doors are installed to replace a single door in the front end of the locomotive. The equipment compartment is lengthened 35 in. on each end by moving the operating cab forward, thus providing for side aisles and rearrangement at compressors and blowers.

Radio equipment is installed to provide communication with the train dispatcher, and other mobile units, including walkie-talkie equipment used in cabooses.

Equipment for making the changes outlined above was purchased from the New York Central, and consisted of equipment removed from the Cleveland Union Terminal locomotives which are being converted by the New York Central for use in passenger service on the Harmon Electrified Division.

The rebuilt locomotives are being assigned a 700 series number as converted, and will be known as the 700 Class locomotives.

A solenoid, pointed to by the operator's cap visor, under test.



Rear view of solenoid tester, with cover removed.

Solenoid Tester

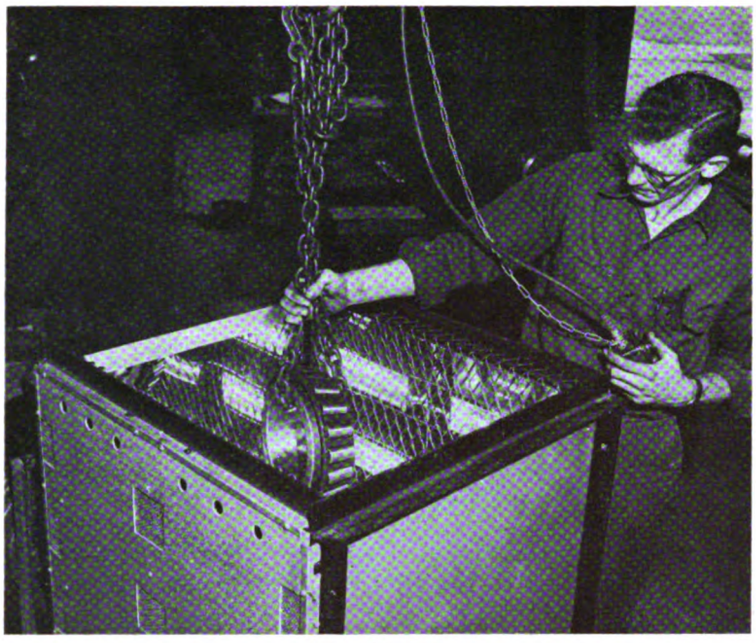
The device shown in the illustration used for testing the two solenoids used on General Electric 17MB6 governors was developed in the Baltimore and Ohio's Glenwood, Pa., shops. It is necessary to determine that the solenoid plunger or armature does not bind against the springs at the top of the solenoid, to see that there is not too much play in the ball joint between the armature and the turbine arm, and that the armature is in balanced position when the current flow through the solenoid coil is 475 milliamperes.

The solenoid to be tested is mounted on top of the test box at the right as shown. The lower end of the turbine arm is in contact with the long pointer arm. The free end of the pointer appears over a scale under the oblong glass at the left and the turbine arm is connected to the pointer arm so that the movement of the end of the pointer multiplies the movement of the turbine arm at a 14 to 1 ratio.

Just below the solenoid in the front panel is a magnifying glass, through which the operator may see an enlarged image of the ball joint. Also at the position of the operator's finger is a small lever by means of which he can move the pointer arm manually. This permits him to determine if the solenoid armature is free and if there is excessive clearance in the ball joint of the yoke. To find if the solenoid is properly balanced, the operator adjusts the current through the solenoid to 475 milliamperes as indicated by the meter on the panel. With this current flowing through the solenoid, the pointer should be in mid-position. It is an extremely accurate test which shows any irregularity of movement of armature under test.

The equipment in the case includes a transformer, a small dry-plate rectifier, capacitors, a rheostat, a milliammeter, a dial light, an inside light to illuminate the portion of the pilot valve plunger seen through the magnifying glass and necessary wire and switches.

Ice water being poured on a fused quartz lamp to show its thermal and shock resistant qualities.



This portable oven unit equipped with 12, 1,000-watt quartz infrared lamps does a fast, efficient job of expanding bearing assemblies for easy fitting to heavy equipment. Oven is well ventilated and insulated. Six switches provide flexible control. Individual reflector units used are commercially available.

Infrared Shrink Fitting

By R. L. Henderson
Illuminating Engineer, Lamp Division
GENERAL ELECTRIC COMPANY

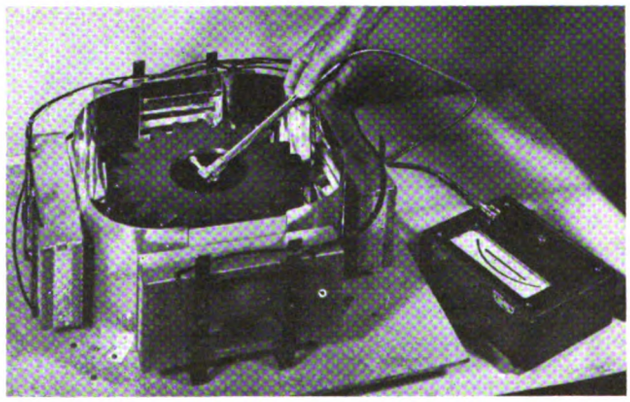
A NEW METHOD OF HEATING large pinion gears, bearing races, couplings and other machine parts to be shrink-fitted into mating shafts, has recently been made available. This is by the use of infrared quartz lamps as the heat source. The lamps required are now commercially available in seven sizes with a variety of lengths and wattages.

The advantages of these new lamps are many. They produce high energy concentrations in a small space,—100 watts per lighted inch of tube length; they produce full radiation almost instantly, not requiring a warm-up period; they produce visible light as well as infrared radiation (an advantage in some circumstances); they are extremely light in weight; and they require little maintenance having a rated trouble-free burning life of over 5,000 hours.

Because of the very close tolerances required in shrink-fitting, special care must be taken to keep the temperature within specification. In the case of diesel traction motor pinions, if the temperature is too high, the pinion will advance too far on the shaft and may split. But if the pinion is not heated enough, the advance will be less than that required and the pinion will slip on the shaft.

A new oven has also been developed so that these lamps may be used to advantage in this particular shrink-fitting operation. Seventeen tooth pinions were brought to a temperature of 360 deg F in less than 15 minutes in the oven, and 23 tooth gears to the same temperature in less than 30 minutes. By comparison, 21 tooth gears were heated by conventional methods and also by using radiant energy. The initial temperature of these gears was 78 deg F at the start. In 22.5 minutes, the temperature of the gears heated by conventional methods was only 170 deg F, while the temperature of the gears heated by radiant energy was 322 deg F. All readings were taken inside the pinion bores. Temperature readings inside the bores of the gears in the infrared unit were uniform and skin effect was slight.

The great advantage of the radiant energy method is the total absence of a warm-up period. Complete control



A newly developed quartz oven which contains four fixtures, each holding two 500-watt, 115- 120-volt quartz lamps. The eight lamps are connected in parallel, drawing approximately 33 amp. The reflector material is Alzak and the fixture base is transite.

of the temperature rise of the Metal part being heated can be maintained at all times. In addition, the infrared-type of oven has the following outstanding features;

1. It is light in weight and can be easily carried by one man.

2. It can be operated on conventional 115-120 volt circuits.

3. It is flexible. Circuit connections can be altered for series, series-parallel, or parallel operation of the lamps depending upon the available voltages and on intensities desired. The shape or size of the unit can also be altered to suit the circumstances.

4. It is relatively inexpensive to build and operate. The cost of the power used in heating the 21 tooth pinion gears was approximately 2 cents.

5. It requires little or no maintenance. The quartz lamp has a life in excess of 5,000 hours, if operated at conventional voltages, and is also resistant to thermal shock.

There are many other applications of these new lamps in industry. For example, they are now also being used to bake motor armatures.

Tips on Care of V-Belts

TO ASSURE LONG LIFE and proper operation of V-belts, the first step is to make sure the proper V-belt is selected to fit the pulley exactly. There are belts for all pulley sizes. If the pulley groove is too wide or too narrow, the belt will not pull properly.

Pulleys must be kept properly aligned. Misalignment causes excessive belt and pulley wear and shortens the life of the belt drive. Increasing the tension of a V-belt in worn or oversized pulley groove will simply make the pulley and belt wear even faster. The pulley should be regrooved or replaced.

Glazed belt sides, loss of power, belt whine and overheating are all signs of V-belt slippage. Here again, the pulleys should be checked for excessive wear.

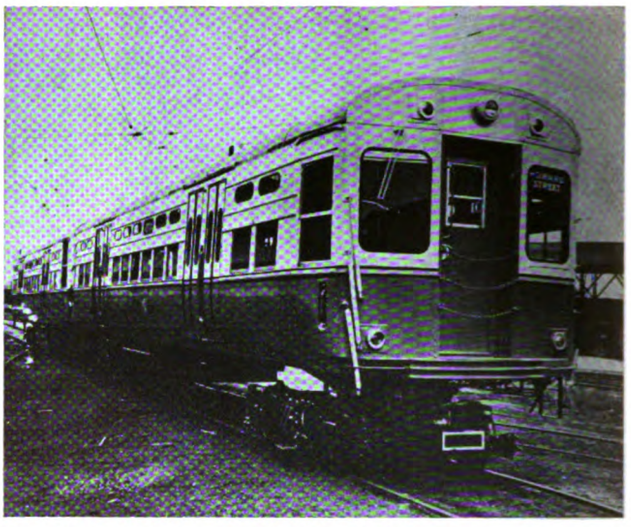
Belts should be adjusted so that they are neither taut nor slack. The proper tension is indicated by a live, springy action.

When one belt in a multiple drive wears out, all should be replaced. In the long run, this is much cheaper than simply replacing the worn part. Where one belt is new and the rest are used, the new belt will have to carry most of the load and will wear out much sooner than it should.

The accurate matching of V-belts is even more important on railroad equipment than in industry because of space limitations, high temperatures and continuous operation. To minimize the amount of down time required for repairs, complete replacement sets of V-belts should be kept on hand.

V-belts should never be pried onto pulleys. The proper installation method is to loosen motor mount bolts or idler lock nut, slide the motor forward, or relieve the idler tension and drop the belt over the pulley. If belts are pried, the stretch-resistant cords may be damaged or broken.

Where belts are to be used for excessively hot or oily operations, there are cog-type belts, made of special rubber compounds which effectively resist oil, grease and heat.



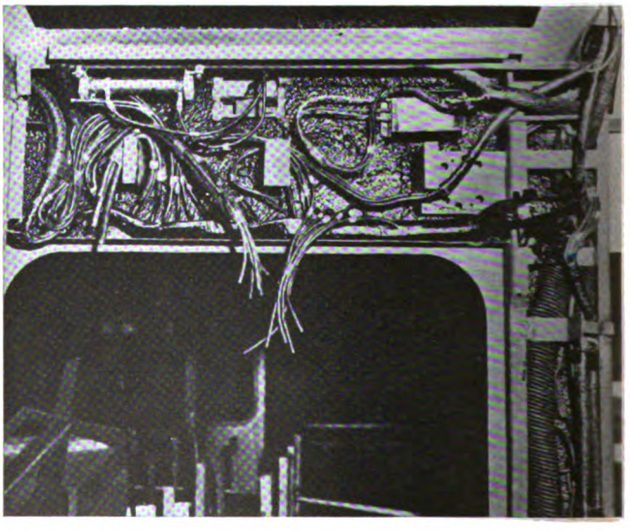
Two of the 250 subway cars built by the St. Louis Car Company for the Chicago Transit Authority.

Prefabricated Assemblies for Car Wiring

PREFABRICATED ASSEMBLIES of wiring have played an important role in the construction of 250 subway cars by the St. Louis Car Company for the Chicago Transit Authority.

Approximately 247,000 ft,—more than 46 miles,—of National Electric Products Corporation car wire was used in the installation. The 600-volt wire, ranging in sizes from No. 4 to No. 16, was used throughout the interior of the cars to provide electrical service for lighting, air-conditioning, heating, communications and general operations.

Assembly lines were used to fabricate much of the wiring which went into the cars. Considerable saving in construction time was reported as a result of the prefabrication and the use of wire with a small overall diameter. The wire used has a neoprene jacket as protection against acids, heat, oil, moisture and the heavy vibration conditions encountered in railroad service.



An example of the prefabricated wire assemblies and duct used in wiring the cars.

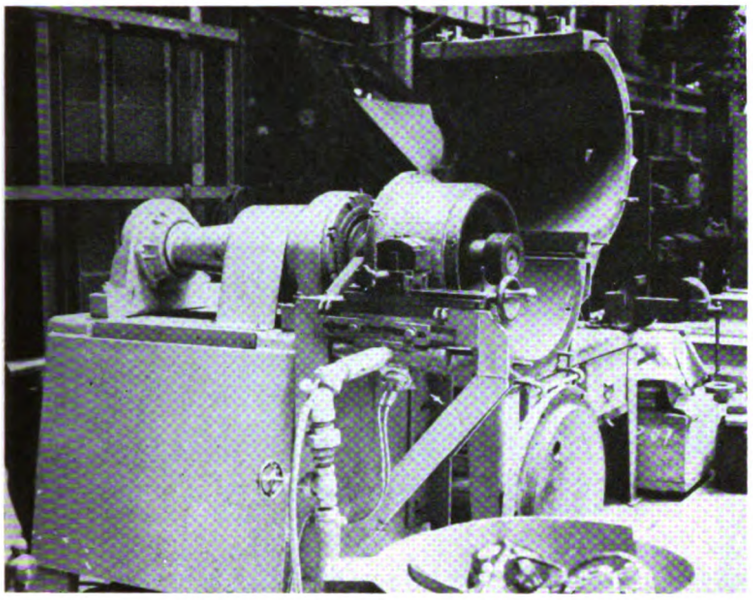


Fig. 1—Commutator seasoning machine with hood open and grinding head in place.

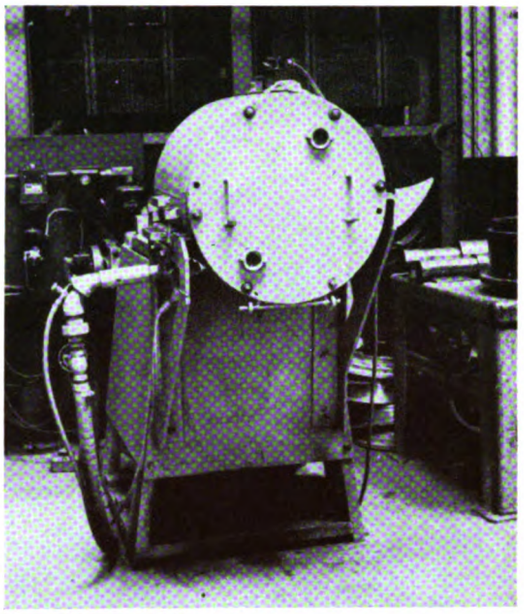


Fig. 2—With the hood of the commutator seasoning machine closed, heat is contained and temperatures of all parts are uniform.

Commutator Seasoning In the Railroad Shop

■ Facilities have been developed in the Silvis, Ill., electric shop of the Rock Island for seasoning commutators which have been removed from the armature and also for seasoning commutators which are mounted on the armature.

Commutators removed from the armature are seasoned in the machine shown in Figs. 1 and 2. For this operation, they are run at a speed of 2,750 rpm, while they are heated, and held at a temperature of 320 deg F. They are run for a period which may vary from 16 to 90 hours until the commutator is seasoned as indicated by feel with the

> Rock Island makes a practice of seasoning all traction motor commutators which have been in any way disturbed

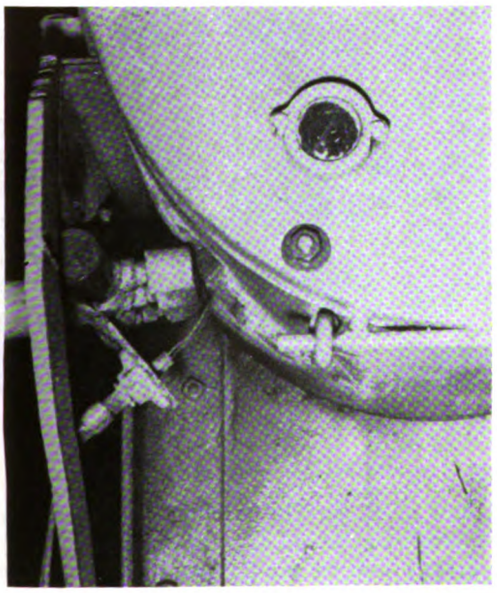


Fig. 3—The gas burners and electric gas lighter at the base of the machine.

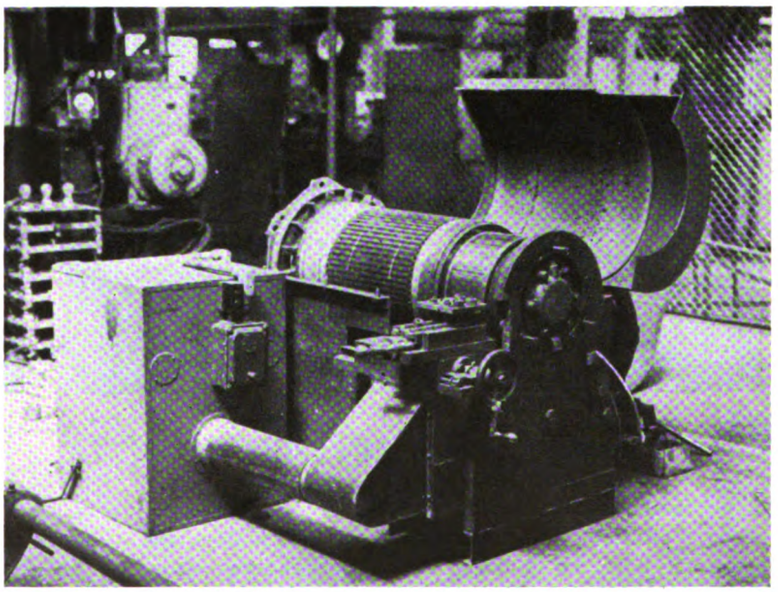


Fig. 5—The machine used for seasoning commutators after they are applied to a rewound armature.

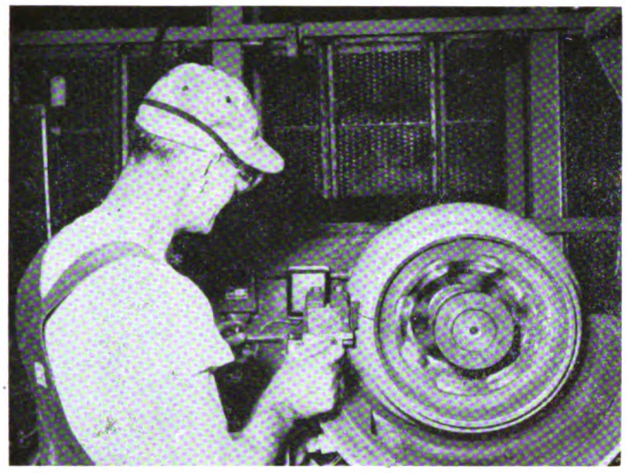


Fig. 4—Commutators are ground after the first seasoning operation.

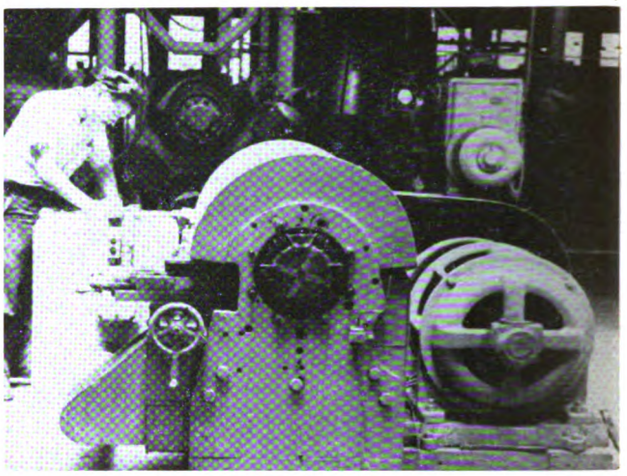


Fig. 6—An operator make a periodic record of temperature during a seasoning operation.

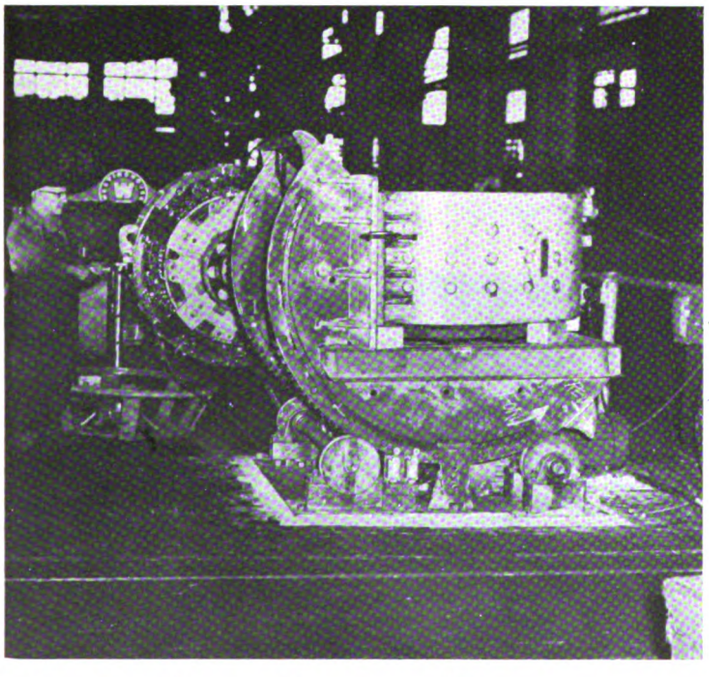
corner of a graphite brush held against the spinning commutator.

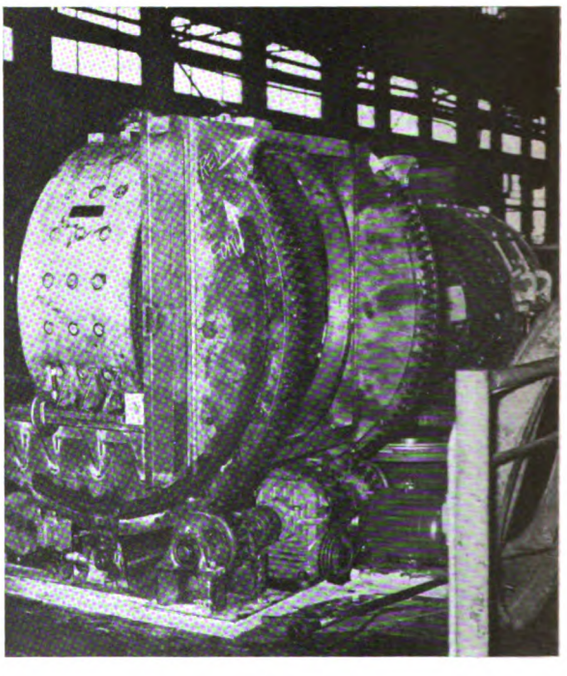
The heat is supplied by gas flames. The burners at the bottom of the seasoner housing are shown in Fig. 3. The gas is ignited electrically and a baffle inside the housing keeps the flame from actual contact with the commutator. The housing retains the heat from the flames and equalizes the temperature on cell parts of the commutator.

Normally, the commutator is seasoned for 16 hours, ground with a stationary stone at 300 to 400 rpm, and seasoned again for five hours. It is then checked for smoothness. If it does not pass this test, it is run again for eight hours—reground—run for five hours, and rechecked.

Then if it does not pass the test, the commutator is placed in a hydraulic press. A pressure of 50 tons is applied and the bolts are drawn up with a torque of 320 ft-lb, while the commutator is under pressure. The seasoning process is then repeated.

After rewinding, the commutator is again seasoned on the armature seasoning machine shown in Figs. 5 and 6. Commutators are rebuilt if no more than 16 bars, consisting of 4 bars in 4 sections are required for repair.





Up-Ender—Large Size

By increasing the dimensions, motor size and gear-drive capacities of an up-ender for traction motors, the generator up-ender shown in the illustrations was made. It is a product of the Canadian National Pt. St. Charles shops, and has proved its value as an aid to diesel locomotive generator overhaul. The machine is operated by pushbutton controls on the end of a control cable. It may be stopped in any desired position and limit switches prevent its being moved more than a total of 90 deg past the full vertical or full horizontal positions.

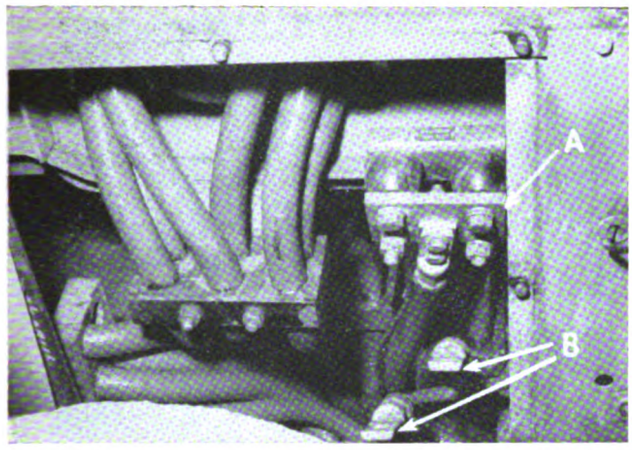


Fig. 2—Alco locomotive. The positive terminal strip is shown at *A* and the No. 1 and No. 4 traction motor armature leads which have been removed are shown at *B*.

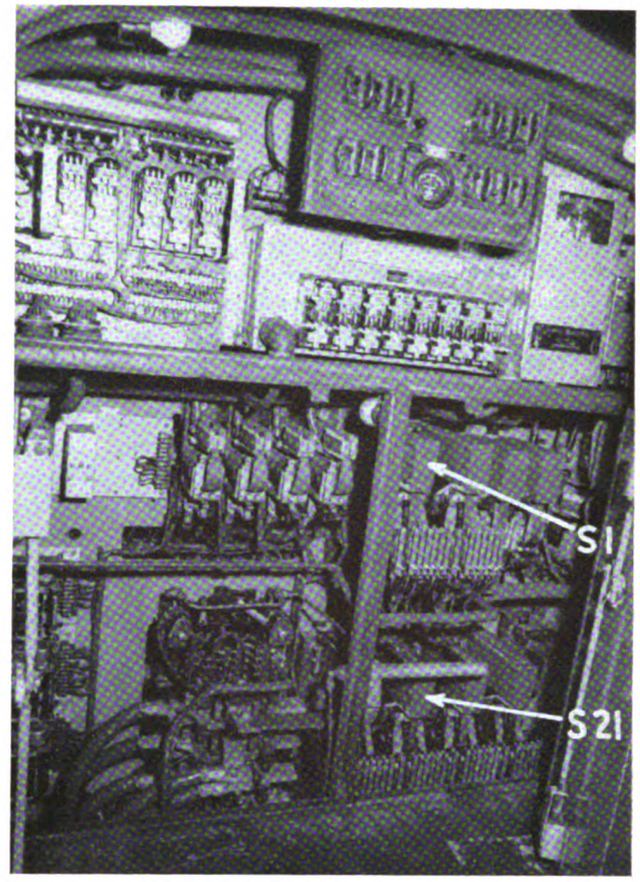


Fig. 3—Control panel for an Alco locomotive showing the location of the *S1* and *S21* power contactors.

How to Find Diesel Locomotive Grounds

By Wayne E. Abbott

By opening circuits in the right places, it becomes relatively easy to isolate parts of the equipment for making ground and insulation tests.

■ Diesel locomotives are equipped with a ground relay and warning signal which operate when the insulation resistance to ground is low. All grounds result from a path of low or no resistance developing so that the power circuits are connected to the locomotive frame. This is not desirable so warning is given by the ground relay operating.

The most common grounds of power circuits result from flashovers at the main generator, traction motors, or both and from moisture and dirt. The ground from a flashover is easily found by inspection. Clearing it is accomplished by cleaning insulators and string band where the path of the ground developed.

To insure that the same condition will not be repeated

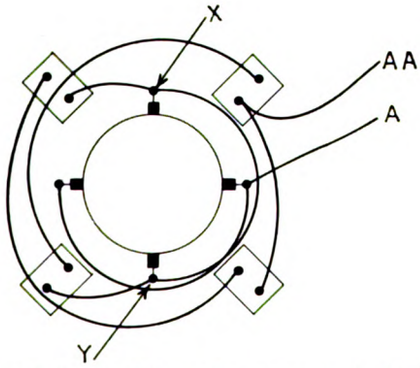


Fig. 1—General Electric 731 traction motor used with Alco diesel switcher locomotives. Only armature and interpole circuits are shown since fields were isolated by placing the reverser in neutral position. *Open at X and Y and insulate.*

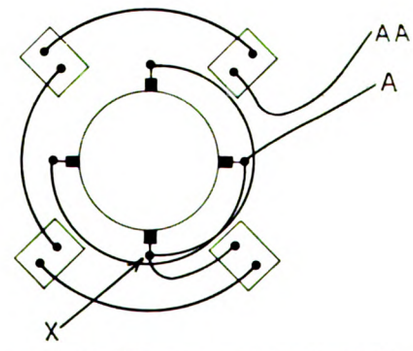


Fig. 4—General Electric 752 traction motor used with Alco diesel locomotives. Only armature and interpole circuits are shown since fields were isolated by placing reverser in the neutral position. *Open at X and insulate.*

again soon, all possible surfaces to ground must be clean of carbon or metal deposits. Poor commutation can be one of the principal causes of both generator and motor flashovers. Poor commutation may be due to sticking brushes, dirty commutator, light brush hammer pressure and commutator out-of-round. Some flashovers are believed to start at the traction motors when there is a wheel slip, particularly at high locomotive speed when all wheels slip. Wheel slip relays are no protection on most locomotives under this condition.

Since the moisture and dirt from oil, water, carbon dust and other dirt will often form a path from some part of the power circuit to ground, which is the locomotive frame, some method of cleaning must be used. This type of ground, either solid or of very low resistance, is often in out-of-sight places in motors and generator. Most of this type of ground develops on the road when motors and generator are under load and therefore warm. Heat alone will not clear the ground nor will it clear away the accumulation of dirt. One of the common methods used for cleaning generator and motors is the use of one of the many electrical cleaners which have been developed for this purpose. The cleaner is used in a spray gun with air pressure to force it in and around the windings.

A Megger instrument reading in most cases is an overall reading of the power circuits to ground. The shortest possible method to isolate the different parts of the power circuits should be used so that the part at fault can be determined.

The following procedure has been found worthwhile, and if a record is kept of the Megger reading, this will afford a helpful check if at a later date there should be another low reading. Cleaning with any of the common methods may bring the reading up, but if repeated cleaning is required, it will be an indication that that part of the circuit must be checked often.

Isolating Power Circuits

Alco 660- and 1,000-hp Switchers

To isolate traction motors from the main generator power circuits for locating the source of a low Megger reading, the following procedure is suggested.

All cables and wires that are disconnected are to be kept clear of each other and ground.

Place the reverser in neutral position.

Open the ground switch.

Take the Megger readings down the left side of the reverser to ground.

AA1 reads No. 1 and No. 2 traction motor armatures, interpoles and leads in series.

J3 reads main generator, No. 3 and No. 4 traction motor armatures, interpoles and leads.

AA3 reads main generator, No. 3 and No. 4 traction motor armatures, interpoles and leads.

J1 reads lead from the reverser to the stationary side of the S contactor.

Take Megger readings down the right side of the reverser.

FF2 reads No. 1 and No. 2 traction motor fields and leads in series.

FF1 reads No. 1 and No. 2 traction motor fields and leads in series.

FF4 reads No. 3 and No. 4 traction motor fields and leads in series.

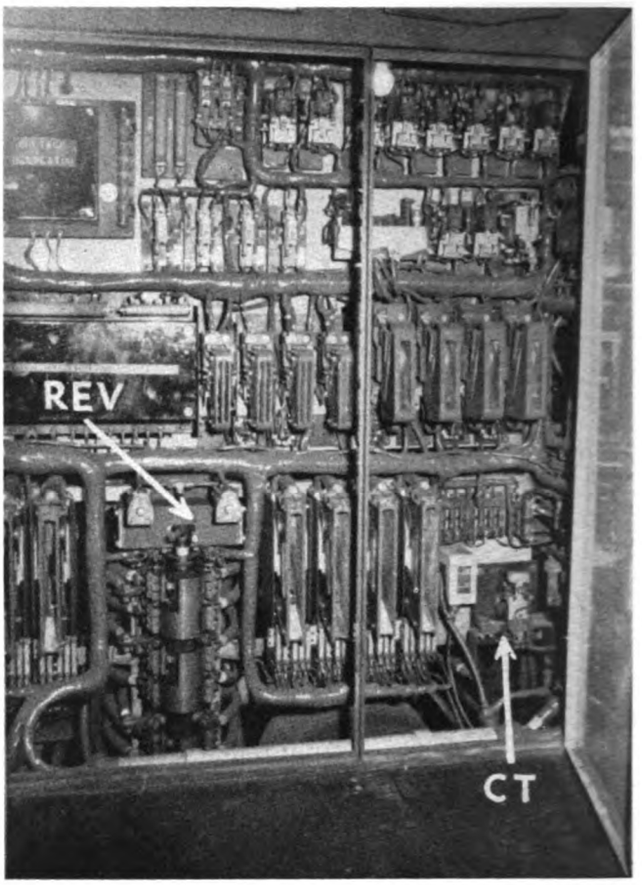


Fig. 5—Control panel for a Baldwin-Westinghouse road switcher showing the location of the *CT* relay.

FF3 reads No. 3 and No. 4 traction motor fields and leads in series.

If a low Megger reading was found at *AA1* on the reverser, open the wheel slip resistor leads and open *AA2* at the No. 2 traction motor. This will isolate the armature and interpole circuits between the No. 1 and No. 2 traction motors.

If the low Megger reading was found at *J3* and *AA3* on the reverser, open the wheel slip leads at the resistor, open *A4* at the No. 4 traction motor, and remove all leads at the stationary side of *SP2*. This will isolate the main generator from the No. 3 and No. 4 traction motor armature and interpole circuits.

If a low Megger reading is found in the No. 3 and No. 4 traction motor armature and interpole circuits, open *AA4* at the No. 4 traction motor. This will isolate the armature and interpole circuits between these two motors.

To isolate the traction motor armature from interpole circuits of Alco switchers, open leads at 12 and 6 o'clock brushholders, as shown in Fig. 1, and insulate. Take Megger readings at brushholders and interpole leads.

Alco Road Switchers

To isolate traction motors from main generator power circuits for locating the source of a low Megger reading, take off the bottom panel, left of center, down back of the control panel. This will expose the positive terminal strip, as shown in Fig. 2.

Disconnect the two cables, as shown, one on the right and one on the left, and keep clear of ground and each

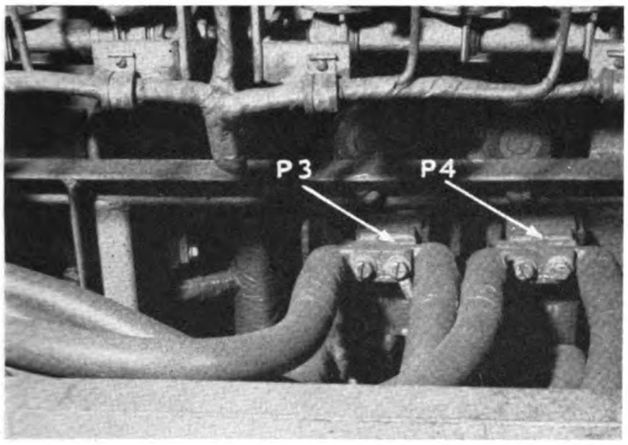


Fig. 6—The P3 and P4 cable connections on a Baldwin, Westinghouse road switcher.

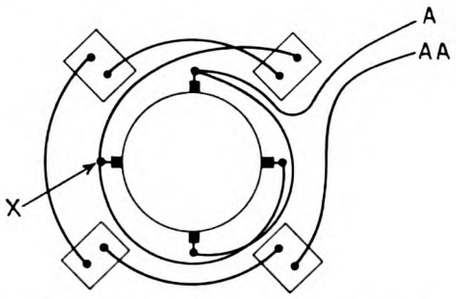


Fig. 7—Westinghouse 352 traction motor used with Baldwin and Lima-Hamilton diesel locomotives. Only armature and interpole circuits are shown since fields were isolated by placing the reverser in neutral position. *Open at X and insulate.*

other. Open the ground switch and place the reverser in the neutral position.

The two cables removed from the positive terminal strip are the armature leads for the No. 1 and No. 4 traction motors. They each have a designating band.

Take Megger readings as follows.

No. 1 traction motor armature lead reads armature, interpole and leads.

No. 4 traction motor armature lead reads armature, interpole and leads.

No. 2 traction motor armature lead reads armature, interpole and leads from the movable side of *S21*, *S1* shown in Fig. 3.

No. 3 traction motor armature lead reads armature, interpole and leads from the movable side of *S1*, also shown in Fig. 3.

All traction motor field and lead readings are taken at the *M* contactors.

Main generator Megger readings are taken at the brushholders.

To isolate traction motor armature from interpole circuits of Alco road switchers, open leads at the 6 o'clock brushholder, as shown in Fig. 4, and insulate. Take Megger readings at brushholders and interpole leads.

Baldwin 1,200-hp Switchers

To isolate traction motors from main generator power circuits for locating the source of a low Megger reading, it is first necessary that all cables and wires that are disconnected are kept clear of each other and ground.

Place the reverser in neutral position and open the ground switch.

Take the Megger readings down the left side of the reverser.

AA4 reads the No. 2 and No. 4 traction motor armature, interpoles and leads in series.

F4 reads the No. 2 and No. 4 traction motor fields and leads in series.

FF3 reads the No. 1 and No. 3 traction motor fields and leads in series.

AA3 reads the No. 1 and No. 3 traction motor armature, interpoles and leads in series.

Main generator Megger readings are taken at the brushholders.

If there is a low Megger reading at the reverser, left side, the motors involved that are in series, can be further isolated by opening the leads under the left side of the frame. If the low readings are in the armature circuits, the leads must be removed from the wheel slip resistors.

Baldwin Road Switchers

To isolate traction motors from main generator power circuits for locating the source of a low Megger reading, place the reverser in neutral position (top portion of reverser is shown at lower left in Fig. 5). Disconnect the two cables at the left side of *CT* (*CT* is shown on Fig. 5, at the lower right corner).

Disconnect the two cables from the top back of both *P3* and *P4* as well as the A + wire. *P3* and *P4* are shown in Fig. 6.

Open the ground switch.

Take Megger readings as follows down the left side of the reverser.

AA3 reads No. 3 traction motor armature, interpoles and leads in series.

FF3 reads No. 3 traction motor fields and leads in series.

AA2 reads No. 2 traction motor armature, interpoles and leads in series.

FF2 reads No. 2 traction motor fields and leads in series.

AA1 reads No. 1 traction motor armature, interpoles and leads in series.

F1 reads No. 1 traction motor fields and leads in series.

FF4 reads No. 4 traction motor fields and leads in series.

AA4 reads No. 4 traction motor armature, interpoles and leads in series.

The main generator Megger reading is taken at *CT*.

Lima Road Switchers

To isolate traction motors from main generator power circuits to locate the source of a low Megger reading, place the reverser in neutral position.

Disconnect the three leads at the positive terminal of main generator. Two of these are power circuit leads and one is from a starting contactor. Disconnect two leads at the left side of *CT*.

Disconnect *AA* + and *A* — at the wheelslip resistors.

Disconnect *A* + and *A* — at *GR*.

Disconnect *A* + and *A* — at *FS1*.

Disconnect *A* — at *TR*.

Pull the battery switch. Take Megger readings as follows down the left side of the reverser.

AA2 reads No. 2 traction motor armature, interpoles and leads in series.

F2 reads No. 2 traction motor fields and leads in series.

AA3 reads No. 3 traction motor armature, interpoles and leads in series.

F3 reads No. 3 traction motor fields and leads in series.

AA4 reads No. 4 traction motor armature, interpoles and leads in series.

FF4 reads No. 4 traction motor fields and leads in series.

A1 reads No. 1 traction motor armature, interpoles and leads in series.

FF1 reads No. 1 traction motor fields and leads in series.

The main generator Megger reading is taken at *CT*.

To isolate the armature from the interpoles of Lima road switchers and Baldwin switchers and Baldwin road switcher traction motors, open leads at the 9 o'clock brushholder, as shown in Fig. 7, and insulate each lead. This will isolate the interpole circuit from the armature and brushholders. Take Megger readings at brushholders and at interpole lead.

From the Diesel Maintainer's Note Book

Now You See It and Now You Don't

By Gordon Taylor

A GP-7 unit was reported as having repeated ground relay actions when it tied up at its home maintenance point. An inspection seemed to indicate that trouble was caused by moisture grounds in the high voltage system. The inspection also revealed that a hose in the engine cooling system had a loose clamp which permitted water to leak into the high voltage cabinet. Water had also run down on to one of the traction motors, which served to divert attention to the motor.

After the water leak was stopped, all wet equipment in the high voltage cabinet was carefully dried and the traction motor was dried out with heat lamps. A megger test indicated that insulation values had been corrected, so the unit was dispatched for service.

The unit operated about 10 miles when it was again in trouble with ground relay action. It was returned to the repair shop, and megger tests indicated a failure of the insulation in one of the No. 2 traction motor circuits.

The motor was isolated from the wiring system and was found to be in good condition. The ground condition appeared to be in the power cables leading back into the car body. The trouble appeared to be of the come and go type; that is, the insulation value revealed by the megger was not steady.

About that time one of our supervisors remembered that a similar elusive case of trouble was found to be due to a grounded condition of the load meter shunt, located in the high voltage cabinet. A prompt check of the ammeter shunt revealed that it was definitely grounded through its mounting base. When the shunt was disconnected from the No. 2 traction motor circuit, the ground disappeared and the megger test showed proper high resistance values.

When the shunt was removed from its fastening in the cabinet, it plainly showed that a water-soaked condition of the fibre base beneath the shunt base had provided a leakage path to ground. The fibre strip had a burned and charred condition. Apparently, the swinging ground action was caused by vibration which shifted the shunt from time to time, creating more or less favorable ground condition.

This case emphasizes the care that should be taken to guard against leaky water hoses and loose hose clamps. There are two hoses on a GP-7 unit located near the high voltage locker, which may, in some cases, water soak the interior of the high voltage cabinet.

Where such a water soaked condition occurs, it is necessary to carefully wipe dry and air out the cabinet. In drying out the apparatus in the cabinet it is necessary to dismount and carefully dry the fibre sheet beneath the load meter shunt to be certain it will not set up a leakage path.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

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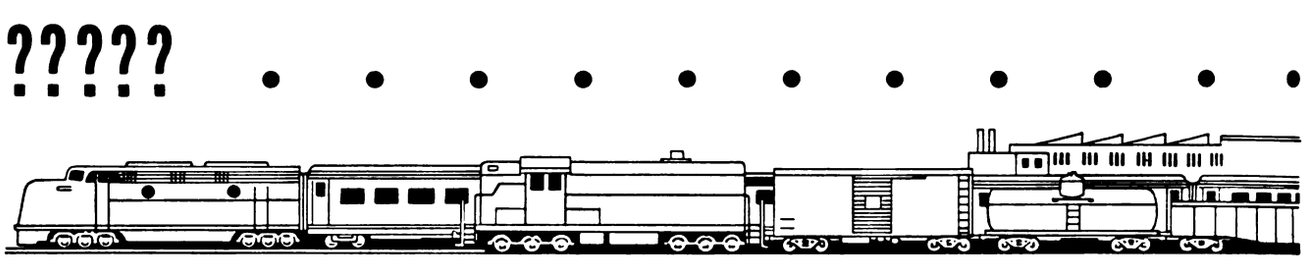
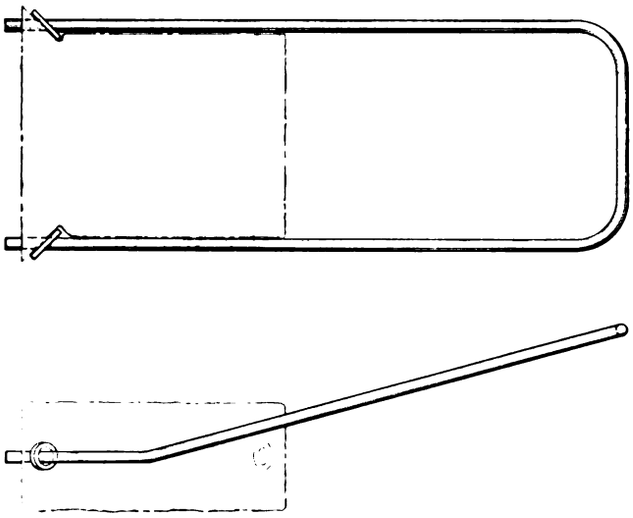


JOURNAL LUBRICATORS

Have any special tools been developed for installing the newly-developed journal lubricating devices, can the regular packing hook be of any use, or is this strictly a hand operation?

DESIGNS TOO VARIED—ONE TOOL CAN'T DO THEM ALL. Due to differences in design and the great number of lubricating devices, it is impossible to develop one tool which can be used to install all types. A number of specialized tools have been designed to apply individual models. One such, now in use, is the Redipaker for the Redipak lubricating pad. It is simply a piece of ⅜-in.



REDIPAKER

diameter rod bent into a U shape. The rod has washers brazed about 1-¼-in. from the two ends. The Redipak pad has four grommets, one at each corner of the pad. The tool ends are inserted through two adjacent grommets, the pad is placed at the journal box opening, and is pushed into place. While this device can be applied by hand, the use of the specialized tool cuts the operation down to about 30 sec per installation.

A number of lubricating devices are equipped with loops of metal or cloth, or with pull-rings to facilitate their removal. Jeffers, Miller, Redipak and Uni-Pak are examples of lubricators so equipped. These devices can be removed with a packing hook. Other lubricators require that the box be jacked and the bearing and wedge be taken out before the lubricator can be removed. After this operation is completed, a packing hook can be used to pull out most of these types of lubricators.

A TROUBLE FREE COMBINATION, *by Old LN Railroader.* Most of the recently developed journal lubricators can be applied without the use of special tools, and in most cases there is little reason to attempt to design such tooling because application by hand is so simple and speedy. Preparation for the application of some of these devices does require previous work.

The Empire journal lubricator, Hennessy journal lubricator, and National Motor Bearing sealed journal box kit all have free oil in the bottom of the box. For each of these devices, the conventional dust guard is not a satisfactory oil seal and each relies on a special oil seal design. To prevent crushing these seals, lateral must be restricted to about ¼-in. and the pre-war bearing and new axles make the most satisfactory arrangement. Preparation of the bearing for application of the Empire lubricator includes drilling two holes in each of the lugs. Springs that hold the lubricator rollers against the journal are hooked through these holes.

The Jeffers lubricator has a built-in seal to prevent oil being thrown out the back of the box. The general designs of the Miller lubricator and of the Cel-O-Pak achieve this same result. These three along with most of the other lubricators use the conventional dust guard and give satisfactory service. The box must be jacked to apply a number of these devices. Typical are the Chenille Roll packing and the Sockell Snug-Fit lubricators as well as the devices using mechanical arrangements—Empire. Hennessy and NMB.

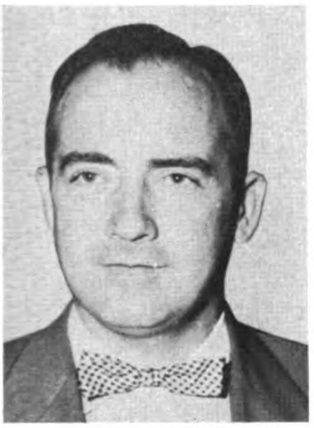
While the applications of all these new devices do not require special tools, they do not completely solve the journal bearing problem. The lubricators and lubrication cannot solve the design problem of having the journal roll out from under the journal bearing under heavy braking or because of impact. When this occurs, the lining of the bearing can be damaged and subsequently can fail in service. The RS journal stop corrects the deficiencies of the original journal, bearing and box design by maintaining the alignment of the axle and bearing. At the same time the journal stops act as retainers for the lubricator. Now that a number of these lubricators have AAR approval for 36-month repack, the combination of journal stops and one of these devices should prove to be trouble free at minimum servicing cost.

SUPPLY TRADE NOTES

(Continued from page 19)

has been appointed technical director, reinforced plastics division.

■



F. H. Williams

SKF INDUSTRIES.—*F. H. Williams*, who has been engaged in engineering sales activities with SKF, has been appointed manager of its railway department, at Philadelphia. *Phillip A. Carlson* has been appointed regional manager of its newly created midwestern sales region.

■

L. F. Williams

COOPER-BESSEMER CORPORATION. —*Lawrence F. Williams* has been elected president, succeeding *Gordon Lefebvre*, who has resigned because of his health.

■

JOSEPH J. RYERSON & SON, INC.—*Henry B. Williams*, sales manager of tubular steel products and cold finished steel bars, has been named manager of sales, New York area. *Robert A. Daggit*, field representative, has been appointed assistant sales manager for the Chicago plant.

■

YOUNGSTOWN SHEET & METAL TUBE CO.—*William E. Fowler* and *Herman J. Spoerer* have been elected vice-presidents.

PULLMAN-STANDARD CAR MANUFACTURING COMPANY. — Pullman-Standard has begun the first phase of a multi-million dollar expansion and improvement program at its freight-car plant in Bessemer, Ala. This phase of the program, scheduled for completion by next April 30, will add 100,000 sq ft of buildings to the existing facilities at a cost of $1,000,000 and will increase production capacity by 1,500 to 2,000 freight cars annually, according to C. W. Bryan, Jr., president.

Obituary

DR. JOSEPH B. ENNIS, retired senior vice-president of the American Locomotive Company, died at Paterson, N. J., on September 22, at the age of 76. Mr. Ennis began his career in 1895 as a draftsman for the Rogers Locomotive Works in Paterson and later worked on general locomotive designs for the Schenectady Locomotive Works, returning to Rogers in 1902. He handled designs and calculation-specifications for Alco from 1902 to 1906 and was subsequently assistant to the mechanical engineer, design engineer, chief mechanical engineer, vice president of engineering, and senior vice-president. Mr. Ennis was also a president of the Steam Locomotive Research Institute.

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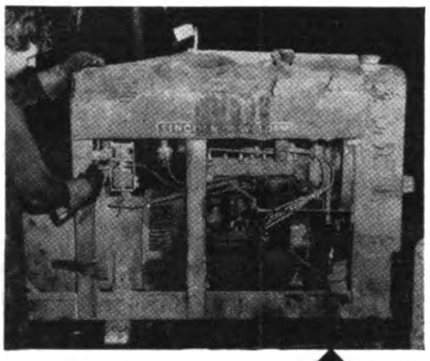
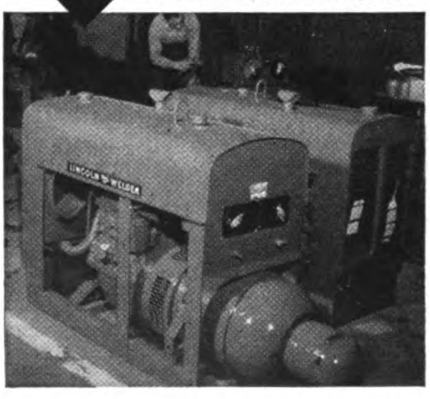


BEFORE "LINCONDITIONING"

AFTER "LINCONDITIONING"



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PRECISION REPLACEMENT PARTS

- All parts are reconditioned and returned to new product standards or are replaced with new parts.

MORE INFORMATION

Learn how "Linconditioning" can cut your repair and replacement costs. Details in Bulletin 4606. Write on your letterhead to The Lincoln Electric Railway Sales Company, 11 Public Square, Cleveland 13, Ohio. Railroad representatives of

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

3 Reasons why...

G.E.'s traction system gives you maximum locomotive performance

1—HIGHER CONTINUOUS TRACTIVE EFFORT

In day-to-day operations, locomotives equipped with G-E traction motors consistently prove their capacity for carrying heavier loads. That's because the GE-752 motor has 15 percent higher continuous tractive effort, at comparable gearings, than any other motor in railroad use. This extra capacity accounts in large measure for its record of low maintenance costs and low percentage of failures—two important factors in lowering operating costs.

2—FEWER LOCOMOTIVE ROAD FAILURES

Although flashovers occur on all locomotives, road failures due to generator flashover are practically unknown on locomotives equipped with G-E traction generators. In actual tests, one G-E generator took over 400 flashovers without failure. Features that assure low flashover damage include: inherently high machine stability; mycalex brush-holder insulators which unlike the porcelain insulators in other generators will not shatter during flashover; and, a brush-holder shield that drastically reduces damage to the brush rigging.

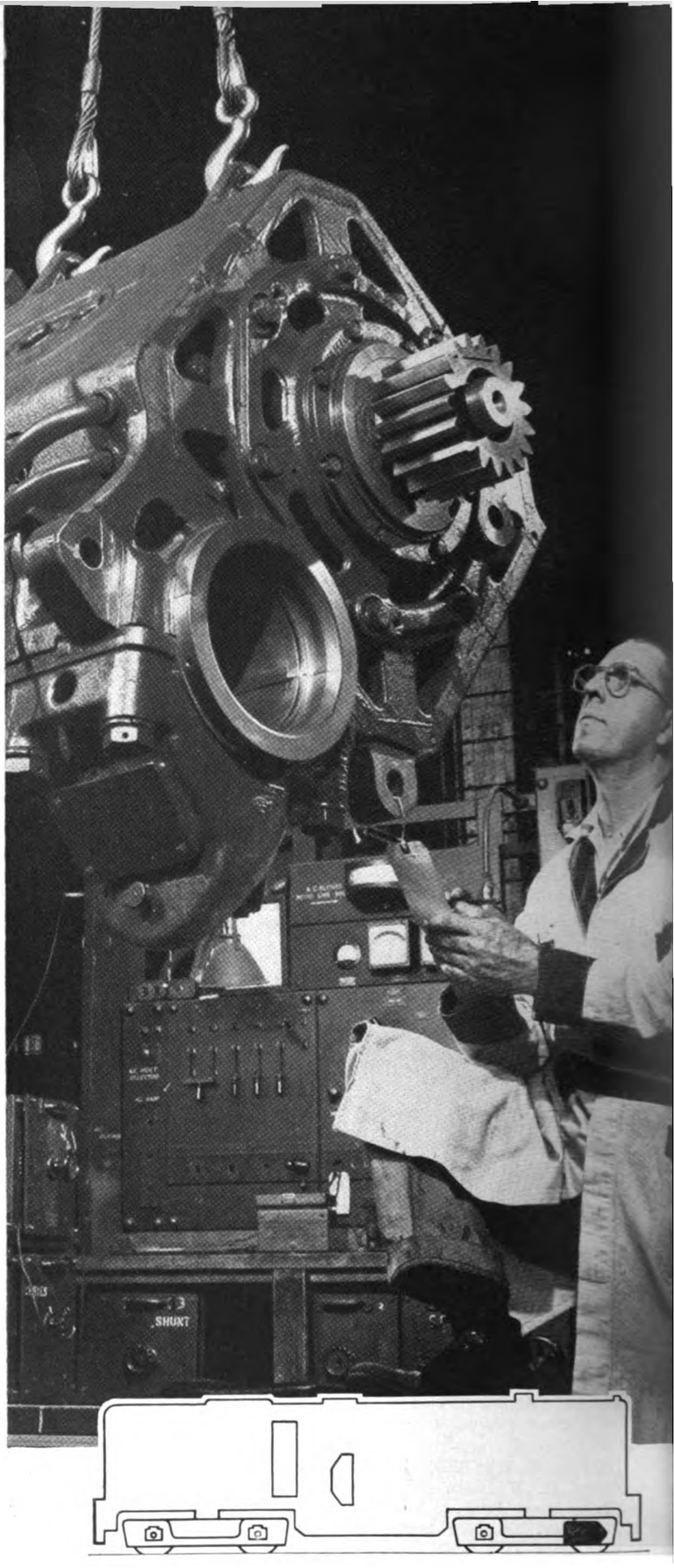
3—MINIMUM MAINTENANCE REQUIREMENTS

One of the chief benefits that any locomotive control system can provide is reliability. It is important to reduce or eliminate those small, continuing and aggravating maintenance problems that occur on some control systems. In actual tests, G-E control has operated hundreds of thousands of miles in heavy mainline service with complete reliability.

Ask your G-E Apparatus Sales representative for more information about the General Electric traction system—the system that sets the industry standard. Or write Section 115-8A, Locomotive and Car Equipment Department, Erie, Pa.

Progress Is Our Most Important Product

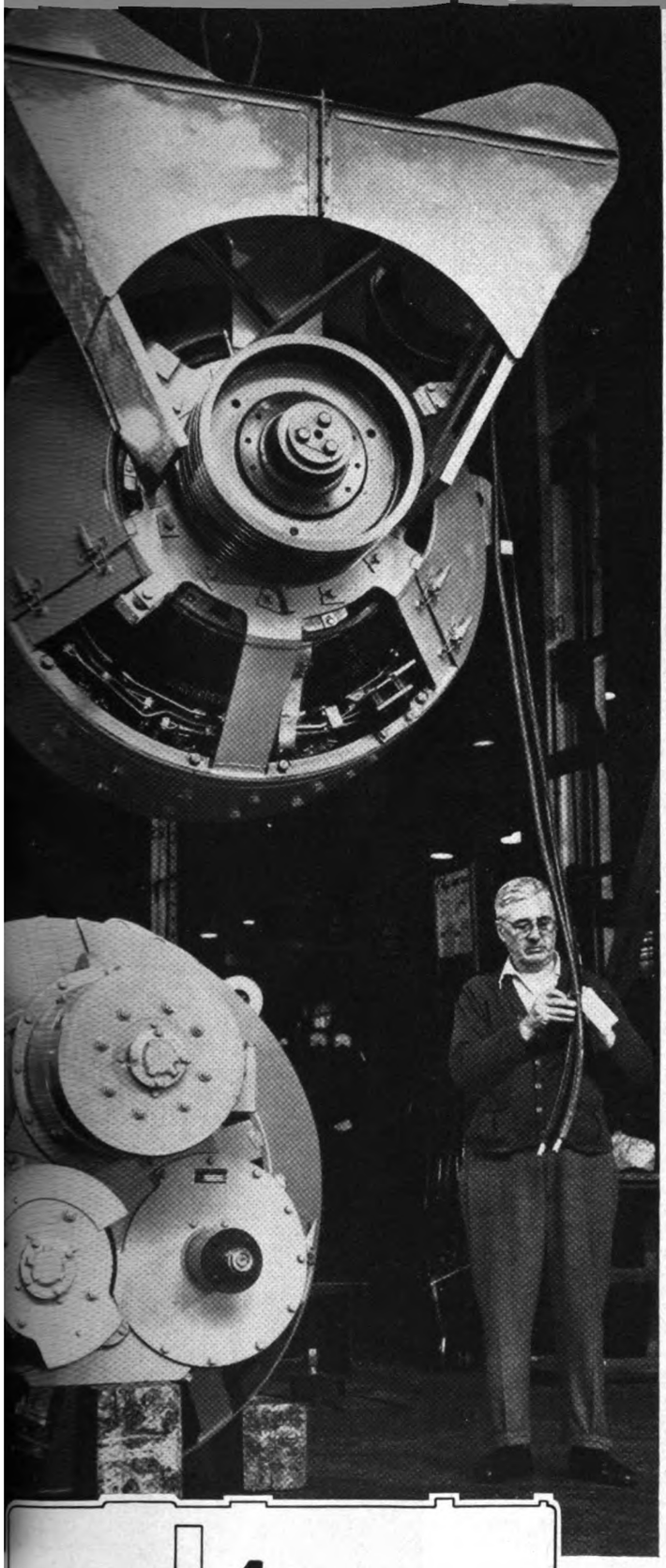
GENERAL ELECTRIC

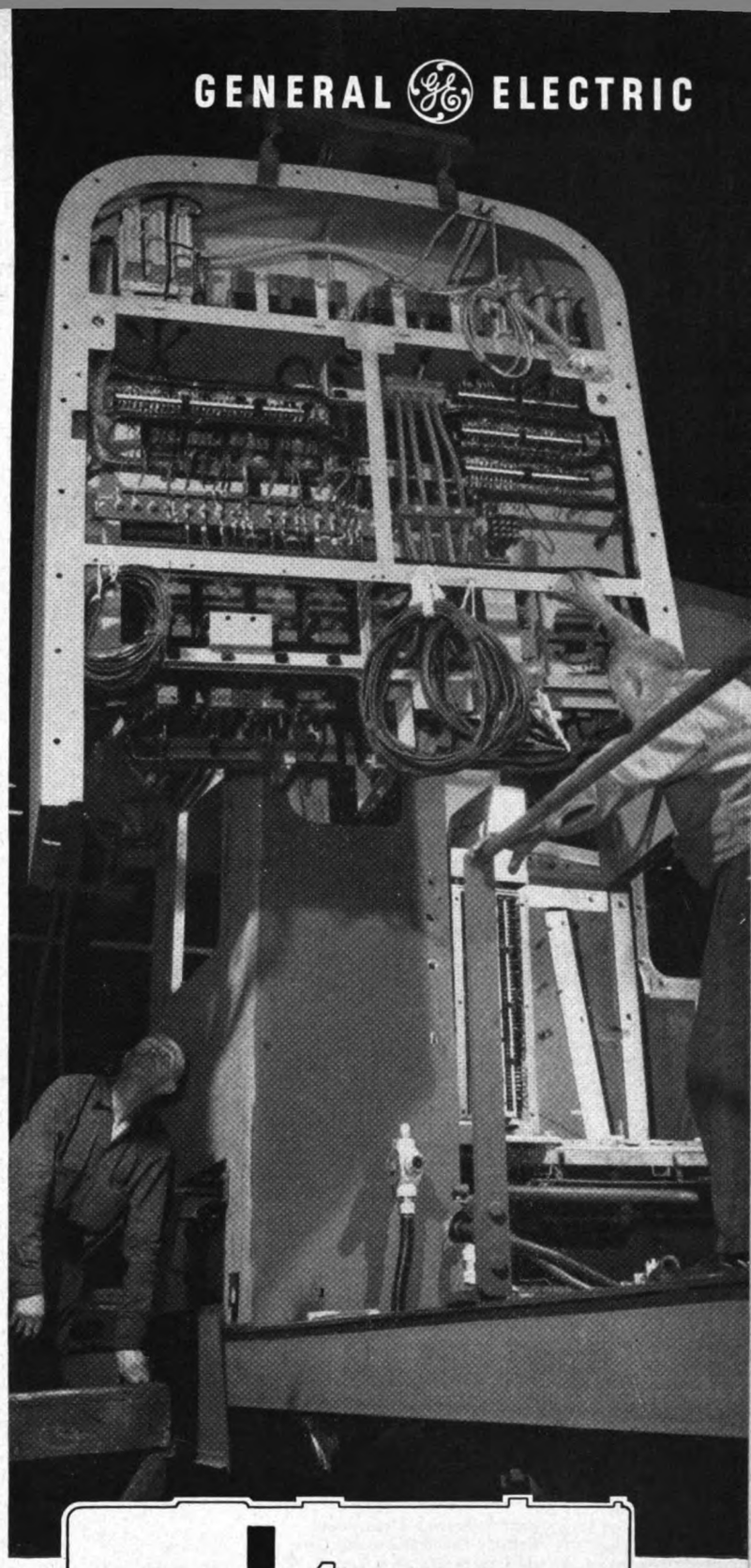


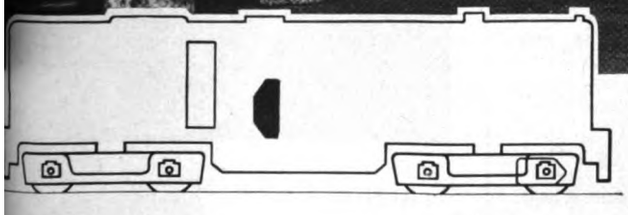
1 G-E TRACTION MOTORS GIVE YOU 15% HIGHER CONTINUOUS TRACTIVE EFFORT

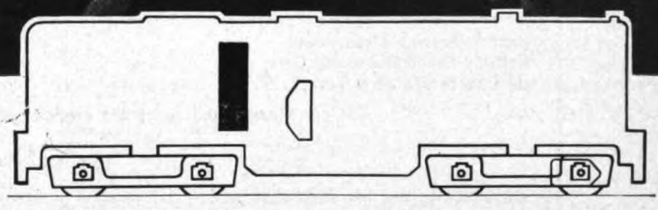
More working material in the GE-752 motor (12 percent heavier than any other motor offered for standard application) means higher ratings. The effective use of additional active copper and iron results in the most powerful traction motor available today.

GENERAL ELECTRIC









2 G-E TRACTION GENERATORS ARE BUILT TO REDUCE LOCOMOTIVE ROAD FAILURES

Because they are designed specifically to take flashovers in stride, G-E traction generators help protect your locomotive from frequent and costly road failures. In most cases, if a G-E generator flashes over, it simply recovers and the locomotive continues its run.

3 G-E CONTROL REQUIRES MINIMUM MAINTENANCE BETWEEN ANNUAL INSPECTIONS

G-E control is simple in construction, with fewer moving parts than other systems. In actual railroad service, locomotives equipped with G-E control have operated from annual inspection to annual inspection without a single detention being charged to the control system.

Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number (s) on coupon below to receive desired information. Requests will be forwarded direct by the manufacturers.

1. ELECTRONICS PRODUCTS. *Allied Radio Corp.* 324-page catalog #150 (1956 Buying Guide) "Everything in Electronics From One Dependable Source, Allied Radio" lists over 26,000 items, with special emphasis placed on equipment for railroad maintenance, research and production requirements.

2. HOT BOXES. *National Bearing Div., American Brake Shoe Co.* 16-page profusely illustrated folder (H-111) "In Action Against The Hot Box" is a progress report on American Brake Shoe's journal bearing Research Laboratory's activities; includes description of the new Redipak lubricating pad developed there.

3. DIESEL ENGINES. *Caterpillar Tractor Co.* 2-color 8-page broadside (717-31554) "Caterpiller Announces Two New Additions to its Engine Family" describes, illustrates and gives specifications on the D342 and D339 heavy duty diesel engines; photos show typical uses.

4. DRY FLUID DRIVE. *Dodge Mfg. Co.* 4-color 12-page bulletin (A-640) "Flexidyne The Dry Fluid Drive" contains full color illustrations, cross section engineering drawings, and shows two methods of selection with easy to use selection charts; includes list prices on all units.

5. SILICONE-RUBBER INSULATION. *Allis-Chalmers Mfg. Co.* 4-page 2-color 3-hole punched reprint-leaflet "Silco-Flex Insulation, Opening the Way to Longer Motor Life" (05R8341) describes and illustrates "Silco-Flex" all-silicone-rubber insulating system for motor and generator stator windings.

6. WAY & SURFACE GRINDERS. *Mattison Machine Works.* 8-page 2-color pull-out booklet tells the story of the new Combination Way and Surface Grinder; describes unique three-column box-type construction.

7. HYDRAULIC VISE. *Columbian Vise & Mfg. Co.* 2-color illustrated bulletin (LL-2029) describes, illustrates and gives complete specifications on the No. 1004 Columbian hydraulic vise; photos show how unit is controlled by 2 simple foot pedals.

8. FLEXIBLE METAL HOSE. *Atlantic Metal Hose Co.* Bulletin (20-E) describes and illustrates corrugated metal hose of annular and hilical construction; includes complete engineering data on bending radii, bursting pressures and weights.

9. WIRES AND CABLES. *Rockbestos Products Corp.* 8-page booklet (RSS #88) "Specifications For Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wires and Power Cables" establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 volt ratings.

10. NUMBERS & LETTERS. *W. H. Brady Company.* 6-page 3-color bulletin (165) "Self-Sticking, All-Purpose Numbers and Letters" for marking bays, bins, columns, posts, barrels, shipping containers, machines and any other equipment in the office, shop or on the road, for identification, safety and maintenance; prices and free usable samples included.

11. PACKAGE DRIVES. *Allis-Chalmers Mfg. Co.* 8-page 2-color 3-hole punched bulletin (51B8166) "New Package Drives for Precise, Wide Range Variable Speed Control" for applications requiring accurately variable speed over a wide range.

12. CHROMALLIZING. *Chromalloy Corp.* 4-page reprint "Chromizing Improves Surface Properties of Steels" describes process for increasing heat, wear and corrosion resistance of ferrous metals by diffusing chromium into the surface at high temperatures.

13. PYROMETERS. *Barber-Colman Co.* 12-page 3-hole punched loose-leaf bulletin (F 7259) "Service Tips—Pyrometer Controllers" covers what to do if instrument reads erratic, instrument temperature curve off, instrument reading too high (or too low), and instrument controls erratically.

14. SCREW MACHINE PRODUCTS. *Abbott Products Inc.* 4-page brochure "Abbott For Precision, Quality, Service" describes, illustrates and diagrams some of the precision parts, specials and standard stock items; six items are shown in detail.

15. PUNCH & DIE. *Whitney Metal Tool Co.* 16-page "Punch & Die Catalog" (P&D) describes and illustrates the complete and diversified line of punches and dies, organized in sections by maximum hole sizes for various standardized types of punches.

16. CLEANING EQUIPMENT. *Acoustica Associates, Inc.* New bulletin (DR-400) describes and illustrates Acoustica Model DR-400 Ultrasonic Cleaning Equipment for production cleaning and degreasing of precision products; includes specifications and photo of the unit.

Reader Service Department **NOVEMBER, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

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Also, please send me additional product information as follows: (company, product & page number) .....

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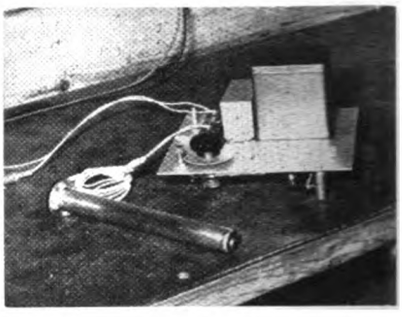
NEW DEVICES

(Continued from page 6)



Refrigerator Car Temperature Control

A temperature control for refrigerator cars has been developed which uses a magnetic amplifier instead of electronic tubes and as a result is claimed to better stand the jolt and vibration of railroad use. This control has an adjustable temperature setting which can be changed from minus 10 to plus 70 deg F by turning one knob on the panel. Its control can be applied to different types of mechanical cooling and heating systems.

The temperature sensing element installed in a cooling air duct is a Vapor Thermistor thermostat in a brass tube. The element is sensitive to 0.1 deg temperature changes. The magnetic amplifier enlarges the small electrical signal from the thermistor to control the cooling or heating equipment. The control panel can be fitted into the refrigeration control panel and requires 220 a-c for operation *Vapor Heating Corporation, 80 East Jackson boulevard, Chicago.*

Traction Gear Lubricator

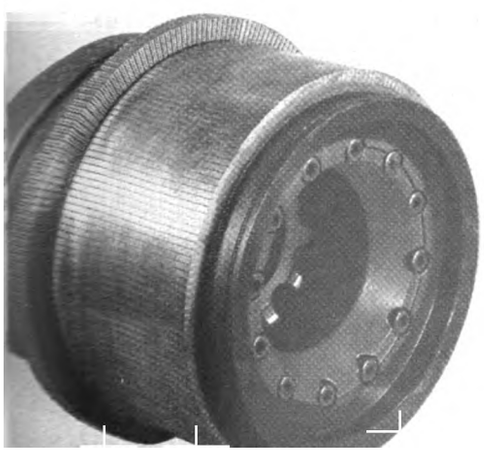
Furnished with an air-operated pump and steam coil heating unit, this outfit can be utilized to dispense lubrication greases to the traction gears of diesel-electric locomotives. The pump with its steam coil works

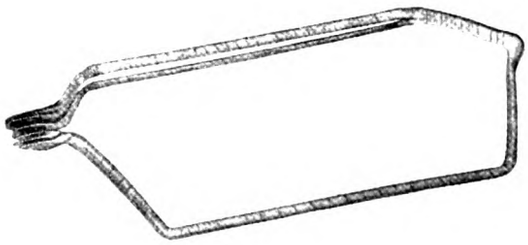
(Continued on page 94)

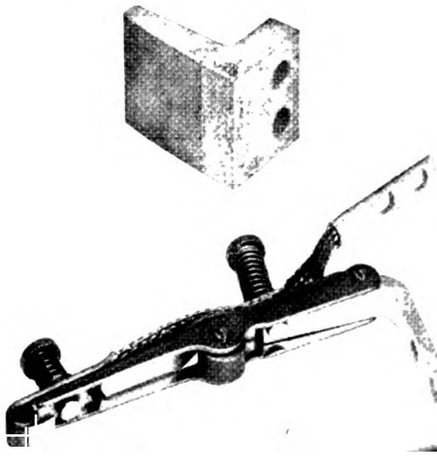
5. **G-E COMMUTATORS** retain smoothness in rigorous service because high-speed, high-temperature seasoning process sets segments firmly in place, cuts down friction wear and tear.

6. **G-E ARMATURE COILS** are available as part of complete rewind kits for your convenience. Every coil is dimensionally accurate and quality insulated for longer life.

7. **G-E CONTACT PARTS** break circuits quickly with a minimum metal transfer. This assures you of long service life from these parts.







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Super resistance to abrasion and corrosion makes this hose excellent for railroads, road equipment, farm machinery, and materials handling equipment. High tensile strength single wire braid. Tough synthetic rubber cover. Working pressures to 2500 psi. Bulk hose and fittings . . . complete hose assemblies at your dealer.

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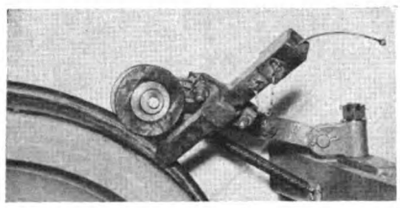
(Continued from page 90)

inside the original drum of grease and enables the operator to supply any required amount of lubricant.

With lubricant temperature of 140 deg F, the unit will furnish 16 lb of grease per min. Lubricant heat-up time depends upon starting temperature.

The outfit includes an 8-1 ratio air-operated pump, 100 lb. drum size; drum cover with port; two-wheeled drum truck; steam coil with shut-off valve and water trap; 15 ft of ¾ in. inside diameter material hose; meter and control valve and long nozzle; and a 60 mesh air-supply screen. *Graco Railway Department, Gray Company, Inc., Graco Square, Minneapolis 13.*



Flange Lubricating Compound and Applicator

Increase in service life of diesel locomotive wheels is claimed for the Transall 3-B compound for lubricating flanges. A compound applicator, Model RD-2, is made to apply the stick compound to flanges. This applicator is spring loaded and is guided by a wheel running on the flange. This wheel rolls on a pre-lubricated sealed ball bearing. The applicator is mounted to the truck frame with a universal bracket. The cap of the applicator is removed for refilling.

The 3-B compound is made of a variety of greaseless, non-friction materials heated together and cast into sticks. It is said to remain only where applied and does not creep onto the wheel tread. *Transall, Inc., Railway Division, P. O. Box 1588, Birmingham 4, Ala.*

Powder-Actuated Stud Driver

The model 455 driver, has interchangeable barrels which permit use of a number of different power loads that deliver impacts of varying force. Each load is designed for proper penetration in structural materials when used with alloy steel studs of specific diameters, lengths and purposes. It accommodates 25 types of ¼ in. studs ranging in length from 1 to 3¼ in., or 12 types of ⅜ in. studs of lengths from 1½ to 4¾ in.

The tool is constructed of polished aluminum and hardened steel. By adjustment of a set screw, the driver can be regulated for two-handed operations. The tool is inoperable if it is inclined more than a minimum safe limit or angle to

for greater
RAILROAD MAINTENANCE SERVICE
FINE ORGANICS offers 2 EMULSION CLEANERS that excel in

- ✓ SOLVENCY
- ✓ DETERGENCY
- ✓ DIRT PENETRATION
- ✓ EASE OF RINSING
- ✓ NON STREAKING
- ✓ NON STAINING

F.O.-106
Specifically designed for exterior car cleaning . . . the degreasing and cleaning of mechanical parts, motive equipment, engines, engine pits, shop floors.

F.O.-116
Made to fulfill the need for a heavy duty cleaner and degreaser. Used for rugged jobs, under carriages and exteriors, running gear and surfaces — and areas subject to heavy oil, asphalt and other tenacious accumulations.

The superior solvency of these two emulsion cleaners . . . the effective dirt penetration and easy rinsability cuts cleaning costs and saves valuable personnel time.

also available **F.O.-162** and **F.O.-102** Carbon Removers

F.O.-128 and **F.O.-101** 'Safe-tee' Solvents

Write to Dept. '3'. for complete information

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211 East 19th St. • New York 3, N. Y.

a smooth work surface. It cocks only when depressed against the work. As soon as pressure is released, the tool uncocks.

A power guide disc attachment on studs serves as a guide for straight driving and seals gases behind the stud for consistent penetration. *Remington Arms Company, Bridgeport, Conn.*

First Certified Short Pocket Draft Gear

The first short-pocket draft gear to be completely tested under Association of American Railroads specifications M-901-A for rubber gears, the new Cardwell Type R-18 rubber draft gear has been granted Certificate of Approval No. 27. It surpassed all the requirements governing capacity, endurance and sturdiness and had a reaction or sill pressure well within the limits of coupler strength.

The R-18 gear was designed for application to the 18½-in. pocket of existing cars of special construction and new ore cars. It is a self-contained factory-assembled unit which is precompressed for easy installation to the car. The gear is symmetrical and no followers are required for the 18½-in. pocket. It is completely interchangeable with friction gears of similar length.

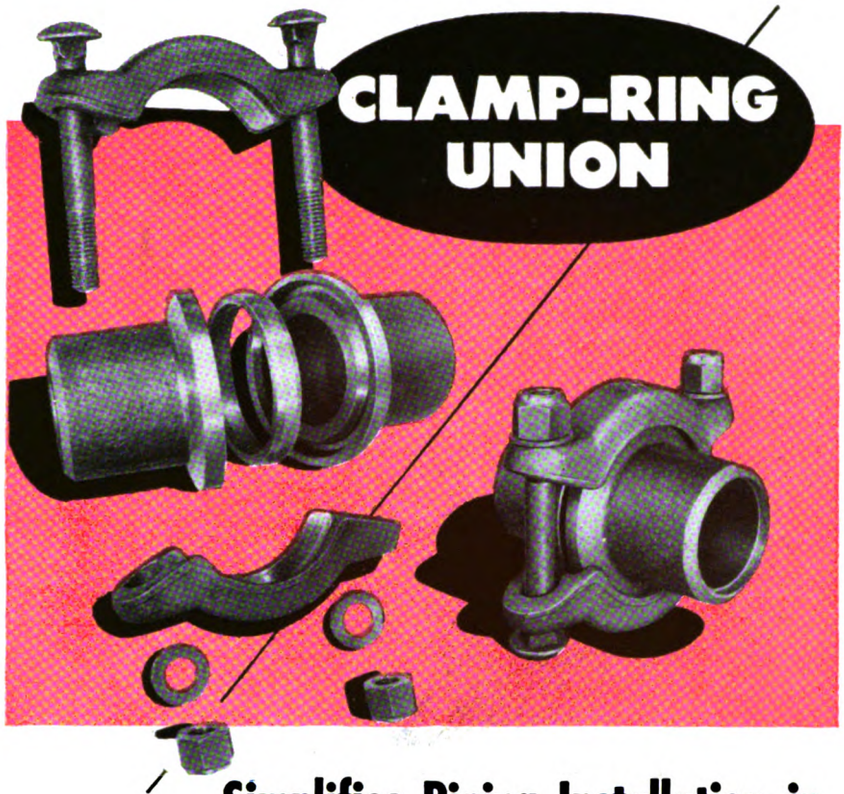
The gear's capacity is obtained in 2¾-in. travel. Of similar construction to the full-size R-20 conditionally approved gear, it further rounds out the Company's line of rubber and of rubber and friction gears. The R-18 is on display at Booths 120 and 121 at the Sherman. *Cardwell-Westinghouse, 332 South Michigan avenue, Chicago 4.*

Vinyl Plastic Tubing

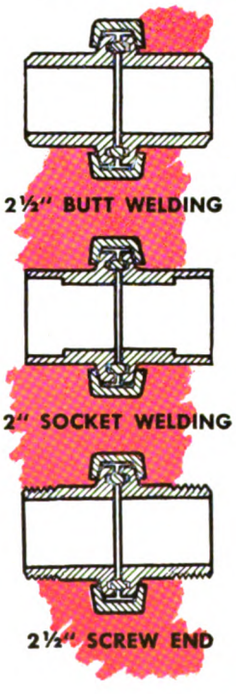
Temflex 105, a vinyl plastic tubing, has been designed to meet the stringent fungus and heat requirements of government specification MIL-I-1631B and is listed as being both self-extinguishing and fungus-proof. Used extensively by electrical equipment manufacturers, the tubing is approved by Underwriters' Laboratories for con-

(Continued on page 98)

WATSON-STILLMAN



Simplifies Piping Installation in Locomotive and Car Heating Steam Lines



Here's the ideal union for locomotive and car heating steam lines. It is readily installed in those hard-to-get-to locations beneath the frame. The clamp can be rotated so that the nuts are in the most convenient position for gripping and turning with a wrench. The union allows the pipe to be pre-fabricated and completely installed in the car frame. When used to join valves with matching ring faces, the W-S Clamp-Ring Union permits easy installation and removal of valves, and allows them to be rotated to any convenient position.

The W-S Clamp Ring Union is presently available in two sizes... for 2" and 2½" IPS pipe. The 2" union has socket-welding ends, whereas the 2½" union is available with butt-welding or screwed ends. Other sizes are available on application.

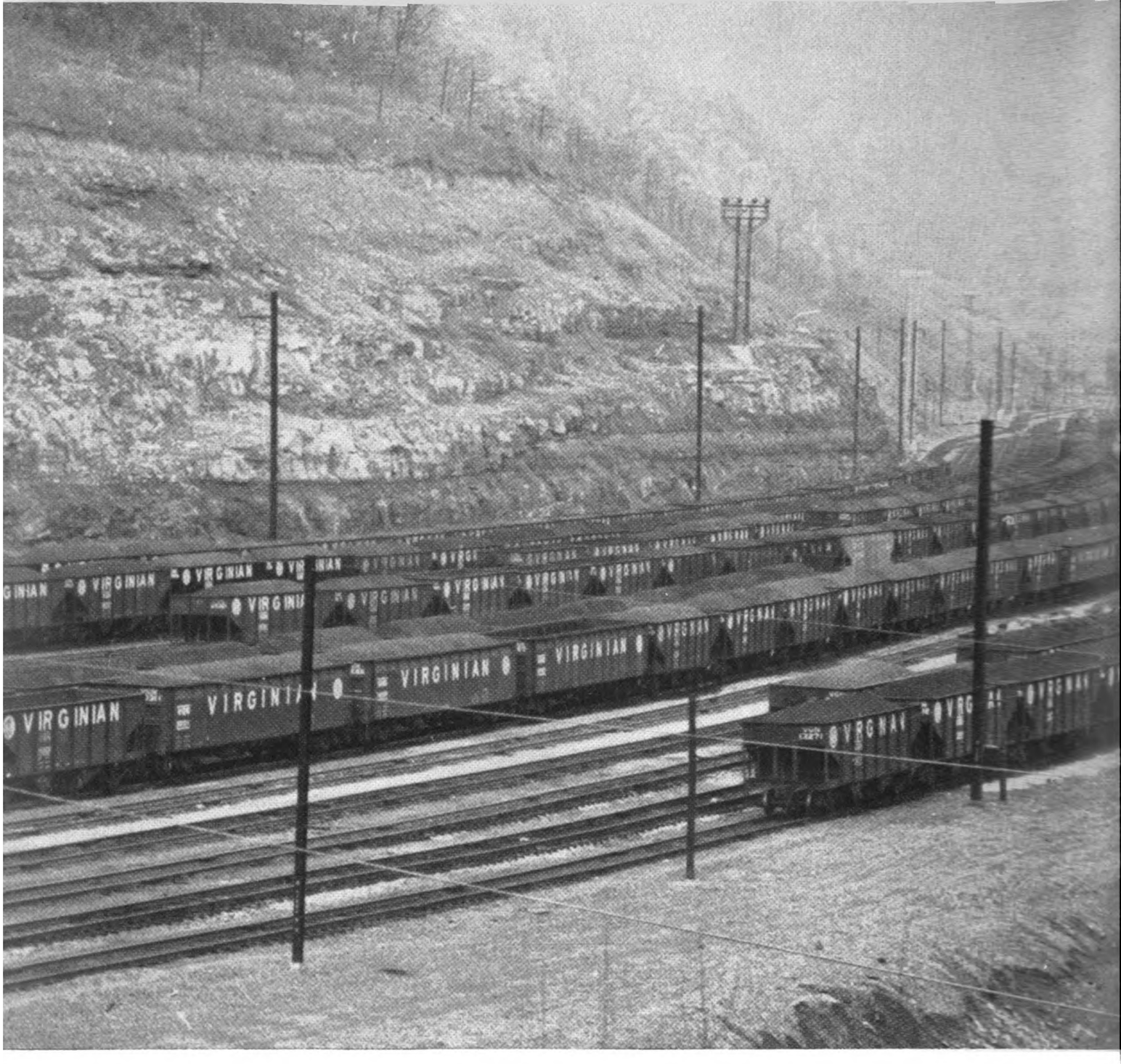
Sold through Leading Distributors

For information on the Clamp-Ring Union and other Watson-Stillman Railroad Pipe Fittings send today for Bulletin RR-1.

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

R3



MORE TONNAGE EVERY MONTH...

is moving faster in trains powered by

Fairbanks-Morse Train Masters.

Their power and versatility prove .....

TM

your soundest motive power buy

FAIRBANKS-MORSE

a name worth remembering when you want the best

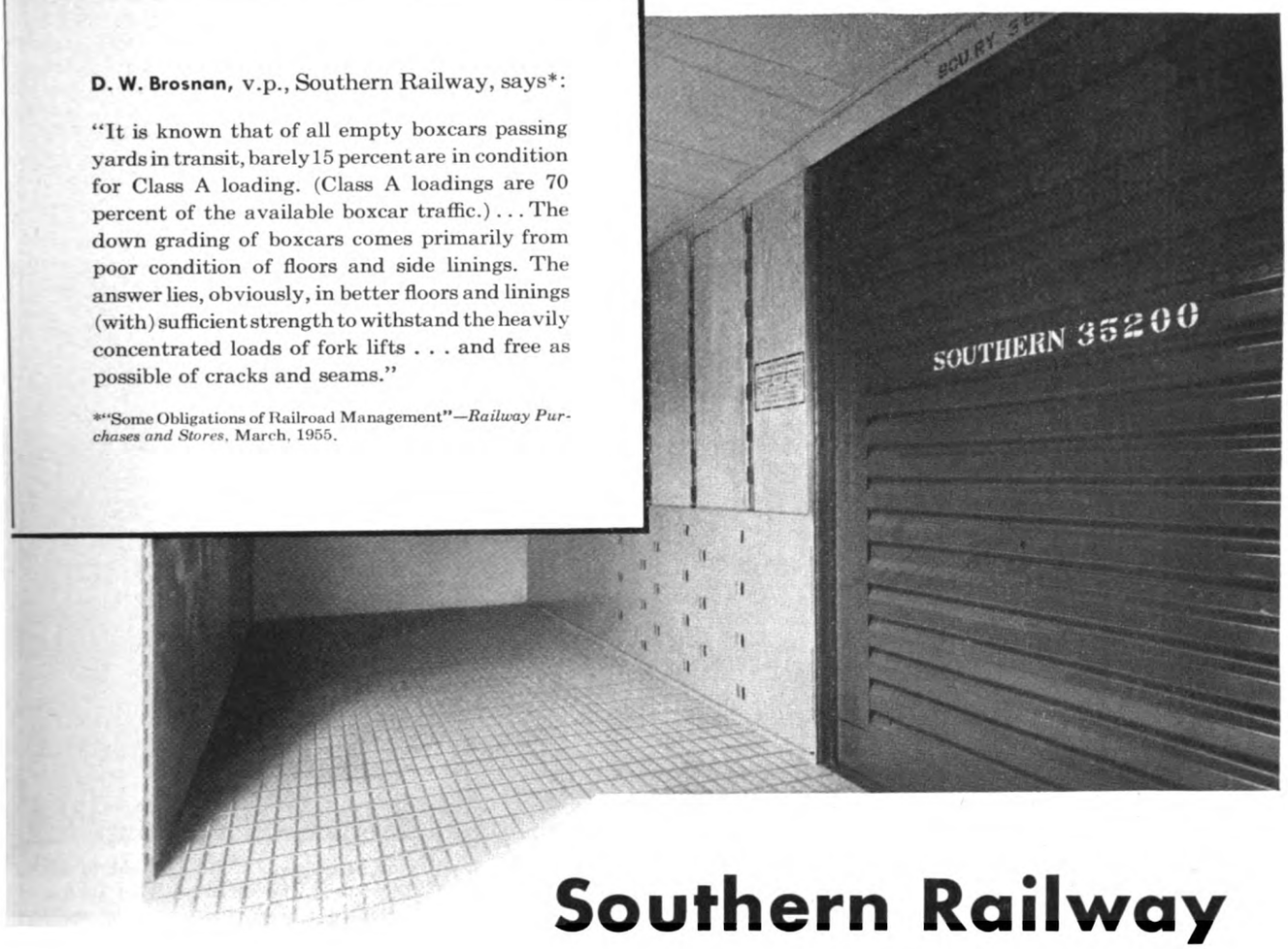
Fairbanks, Morse & Co.,
Chicago 5, Illinois

DIESEL LOCOMOTIVES AND ENGINES • RAIL CARS AND RAILROAD EQUIPMENT • ELECTRICAL MACHINERY • PUMPS • SCALES • WATER SERVICE EQUIPMENT • MAGNETOS

D. W. Brosnan, v.p., Southern Railway, says*:

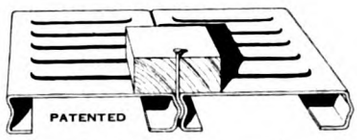
"It is known that of all empty boxcars passing yards in transit, barely 15 percent are in condition for Class A loading. (Class A loadings are 70 percent of the available boxcar traffic.) . . . The down grading of boxcars comes primarily from poor condition of floors and side linings. The answer lies, obviously, in better floors and linings (with) sufficient strength to withstand the heavily concentrated loads of fork lifts . . . and free as possible of cracks and seams."

*"Some Obligations of Railroad Management"—*Railway Purchases and Stores*, March, 1955.



Southern Railway finds the answer with N-S-F

By ordering 1200 boxcars with NAILABLE STEEL FLOORING, this progressive carrier takes an important step to satisfy shippers. The secure steel construction of N-S-F, with the unique nailable steel grooves for blocking, eliminates costly out-of-service time caused by bad-order floors. And Naturally Shippers Favor N-S-F.



NAILABLE STEEL FLOORING is made of low-alloy N-A-X HIGH-TENSILE steel—remarkably strong, corrosion resistant—formed into channels, and welded together to form a unique nailing groove. Nail is clinched in tight grip of steel, yet can be readily removed.

Complete engineering and cost data available from Stran-Steel Corporation, Ecorse, Detroit 29, Michigan. Sales representatives in Chicago, Philadelphia, St. Louis, Atlanta, Omaha, Denver, San Francisco, Montreal, and New York.

STRAN-STEEL CORPORATION

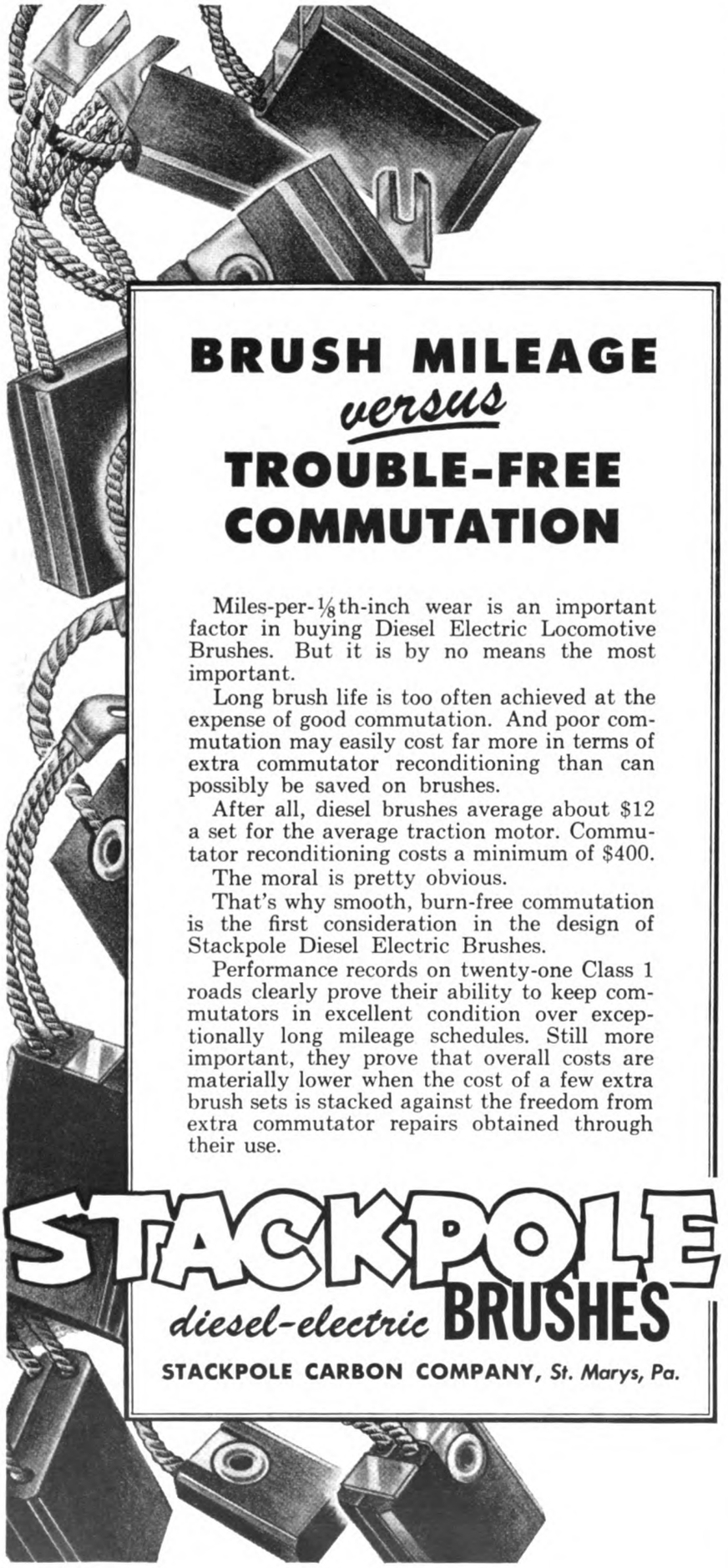
UNIT OF

NATIONAL STEEL CORPORATION

NAILABLE STEEL FLOORING

PAVES THE WAY TO ALL-STEEL FREIGHT CARS

55-SF-3A



BRUSH MILEAGE *versus* TROUBLE-FREE COMMUTATION

Miles-per-⅛th-inch wear is an important factor in buying Diesel Electric Locomotive Brushes. But it is by no means the most important.

Long brush life is too often achieved at the expense of good commutation. And poor commutation may easily cost far more in terms of extra commutator reconditioning than can possibly be saved on brushes.

After all, diesel brushes average about $12 a set for the average traction motor. Commutator reconditioning costs a minimum of $400.

The moral is pretty obvious.

That's why smooth, burn-free commutation is the first consideration in the design of Stackpole Diesel Electric Brushes.

Performance records on twenty-one Class 1 roads clearly prove their ability to keep commutators in excellent condition over exceptionally long mileage schedules. Still more important, they prove that overall costs are materially lower when the cost of a few extra brush sets is stacked against the freedom from extra commutator repairs obtained through their use.

STACKPOLE *diesel-electric* BRUSHES

STACKPOLE CARBON COMPANY, *St. Marys, Pa.*

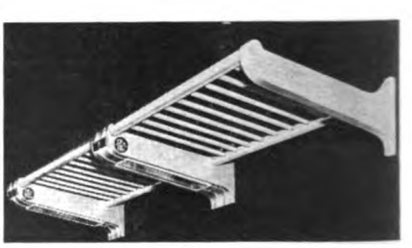
(Continued from page 95)

tinuous operation at 105 deg C. The formulation is said to enhance color stability and reduce shrinkage under conditions of sustained operation at elevated temperatures. *Irvington Division, Minnesota Mining & Manufacturing Co., 6 Argyle Terrace, Irvington 11, N. J.*

Magnetic Plate Clamp

Bux, a magnetic clamp, is said to make unnecessary the expensive labor time and materials previously required in making jigs, dogs, mechanical clamps and similar items as aids in fabrication of metal plates.

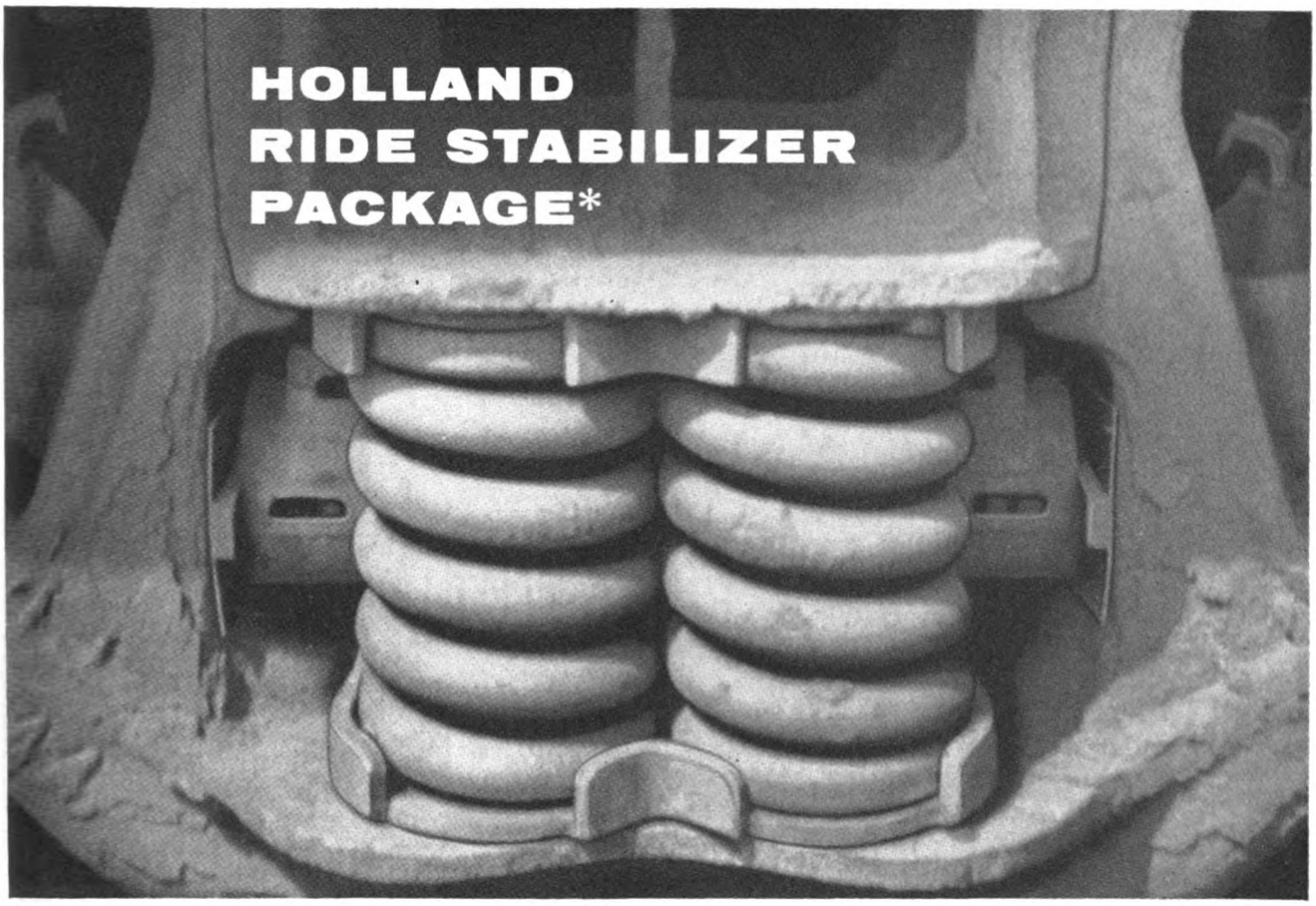
The tool, 21 in. in height and approximately 50 lb in weight, generates 3000 lb of power and can be instantly attached or removed from the job. The clamp pulls edges of heavy steel plate flush for butt welding. It contains a one-piece leverage rod and pressure stud mounted on a swivel to enable the operator to perform lap welding easily. A rectifier unit is contained in the post eliminating the need for external converter units. *Buck Manufacturing Company, Los Gatos, Cal.*



Illuminated Seat Numbers For Luggage Racks

Railroad passengers need no longer be confused or delayed in finding their seats due to inability to see the numbers, according to the manufacturer of illuminated

(Continued on page 102)

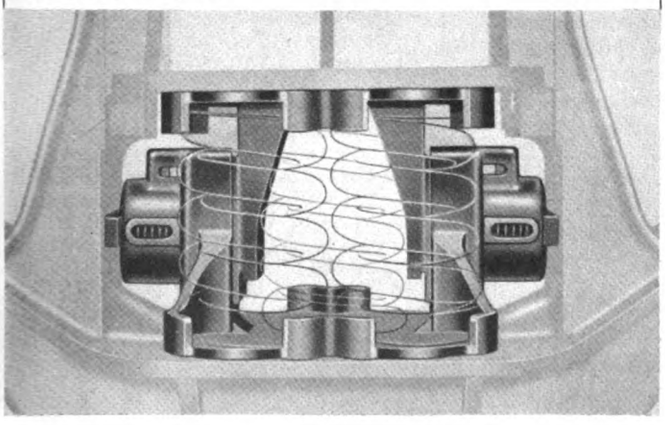


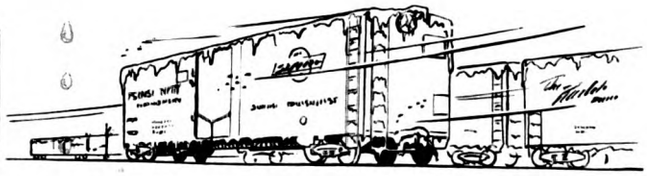
*Pat. Pend.

. . . PASSES MOST RIGID TESTS

No special springs required. Uses standard A.A.R. 2½" Travel, Coil Springs.

No welding; no labor. Simply slip in the complete package.





For several months, the Holland Ride Stabilizer Package has been giving a very good account of itself in actual service, under some of the most severe conditions that a freight car can undergo.

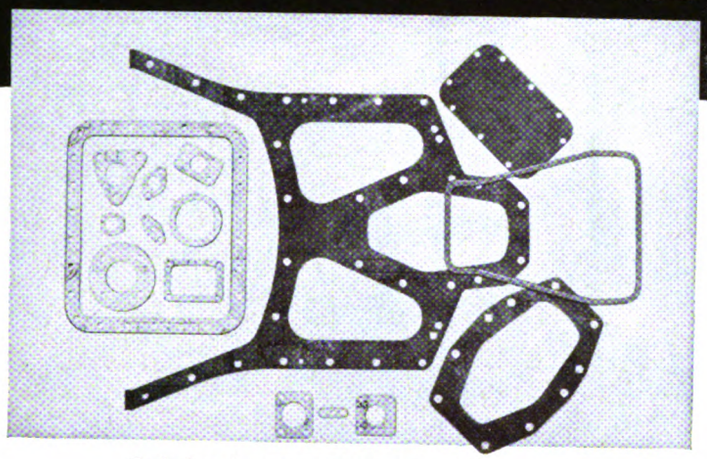
Holland Ride Stabilizer Packages are in daily service in refrigerator cars of a major railroad line. Here, these "packages" encounter salt brine dripping and other extremely corrosive conditions far more severe than are met in the usual freight car operation. Full details of the tests and the "package" will be gladly sent on request.

HOLLAND COMPANY

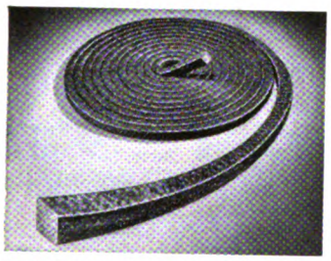
332 s. michigan ave., chicago 4, ill.

68 Years of service to the railroad industry . . .

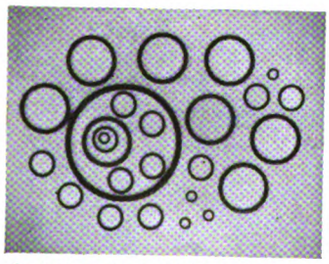
PUT GARLOCK'S VALUABLE PACKING EXPERIENCE TO WORK FOR YOU



Garlock replacement gaskets for diesel locomotives



Garlock LATTICE BRAID* Rod Packing



Garlock Molded Rubber Seal Rings

*Registered Trademark

DIESEL GASKETS, PACKINGS, and MOLDED RUBBER RINGS

Profit by the experience Garlock has gained in serving the packing requirements of most of the Class I Railroads in the United States and Canada. It's yours for the asking.

Your Garlock representative is a specialist who knows the proper replacement part for every diesel locomotive application. He can save you valuable time and help you reduce maintenance and replacement costs.

For your convenience, Garlock diesel replacement parts—gaskets, packings, and molded rubber rings—are pre-stocked in handy packages, ready for immediate shipment.

For long, dependable service, specify Garlock diesel replacement parts. Write for complete parts-and-price list.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada, Ltd., Toronto, Ont.

Branch Offices in Most Principal Cities

GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

(Continued from page 98)

seat numbers which have been incorporated in these luggage racks. The plainly visible, easy-to-read numbers are said to pop right out from the racks and can be identified quickly as approached from either end of the car. *Adams & Westlake Co., 1152 N. Michigan, Elkhart, Ind.*

Air Powered Nail Driver

The Nail-A-Matic, an automatically fed nail driver has been developed to help reduce hand nail driving costs. It will find application in industry for mill work, crating, etc. It can be used for nailing 2-penny up to and including 16-penny nails in hard or soft woods, at any angle, straight or clinched at a speed up to 50 nails per minute.

The hammer will not propel the nail from the nose unless it is first depressed in the material. Nails can be driven flush, countersunk or left extended. The feeder is air operated with no complicated timers or valves.

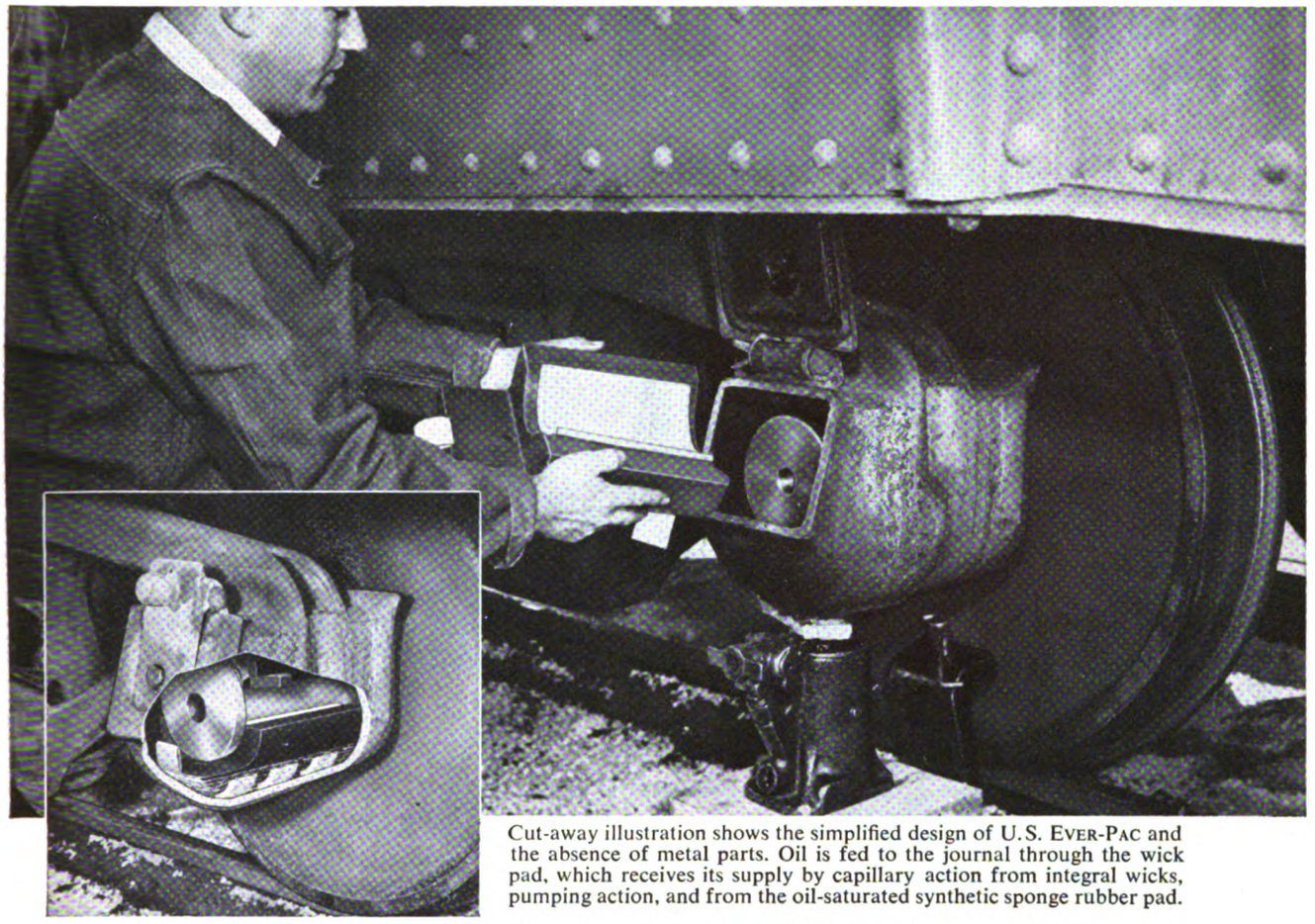
Cam-conversion of the feeder from one nail size to another can be accomplished in a matter of seconds. The unit is mounted on ball-bearing rubber tire wheels and weighs 60 lb. It is equipped with a detachable hopper for dumping nails. *Matrix Engineering Corporation, 3016 East Lake street, Minneapolis.*

Medium-Pressure Welding Blowpipe

The Oxweld W-45, is claimed to offer the greatest welding and heating range ever available in a single hand-welding blowpipe. This medium-pressure oxy-acetylene unit can be supplied with 18 welding head sizes,

(Continued on page 106)

BANISH THE BIGGEST CAUSE OF HOT BOXES



Cut-away illustration shows the simplified design of U.S. EVER-PAC and the absence of metal parts. Oil is fed to the journal through the wick pad, which receives its supply by capillary action from integral wicks, pumping action, and from the oil-saturated synthetic sponge rubber pad.

with the new, proven U. S. EVER-PAC*

Here at last is the Journal Lubricator that meets the railroads' chief demand:

Makes "waste-grabs" and other failures of waste packing impossible!

No costly special oil seals required!

Interchanges with present equipment!
(No shop modifications, machining or additional labor costs)

Low-cost initial installation!

Easy determination of oil level!

Low-cost upkeep!

Trouble-free service!

More than one-half of all hot boxes are directly attributable to waste packing, mostly "waste-grabs." Ever-Pac makes "waste-grabs" impossible!

U. S. Ever-Pac has A.A.R. approval for application to a specified number of cars which move in general interchange service (Docket No. L-129).

Years of intensive research and testing show conclusively that with U. S. Ever-Pac, a product of United States Rubber Company, a major cause of hot boxes can now be eliminated.

EVER-PAC GIVES FULL 3-WAY OIL SUPPLY, MILE AFTER MILE. The reservoir on its underside holds 2 pints of oil, and the sponge rubber pad holds 2 pints more—2 full quarts of oil at all times. Plus 3-way oil delivery:

(1) *Capillary action soaks up oil.* The hungry wick is oil-absorbent. The yieldable sponge rubber, a specially developed synthetic compound, provides a cushioned *upward* contact at all times, providing a controlled rate of *clean* oil distribution.

(2) *Pumping action.* Each vertical or lateral movement of the journal or journal box compresses the pad, thereby setting up a pumping action which pumps oil from the reservoir under the pad through holes to the distributing wick pad.

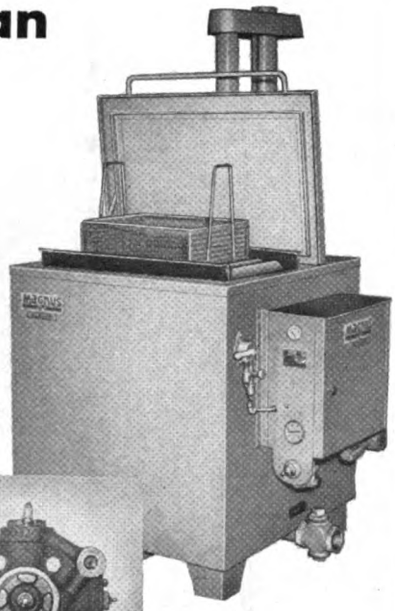
(3) *Sponge pad flexing.* Each movement of the journal or journal box flexes the *yielding* pad and makes the pad "breathe out" *even more oil*—because the pad retains 2 pints of oil *above and beyond* the amount of oil in the oil reservoir. Free brochure gives full details. Write or get in touch with us at Rockefeller Center, New York 20, N. Y.

***Patented**

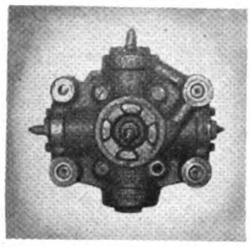
Mechanical Goods Division

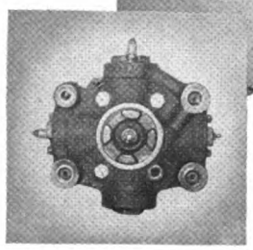
United States Rubber

metal parts come out clean every time



Switch operating valve before and after cleaning in Magnus Aja-Lif cleaning machine.





Faster Cleaning . . . because vigorous mechanical agitation of the parts in the machine cuts cleaning time to a minimum—no costly hand labor involved.

Precision Cleaning . . . because the cleaning solution "scours" all interior surfaces of intricate parts through turbulent contact created by the parts agitating in the solution.

Economical Cleaning . . . because efficient cleaning saves time and labor costs . . . because the Magnus Aja-Lif can be used with any kind of cleaning solution . . . and because there are few moving parts to wear—no gears or electric motors.

Convenience . . . because the work platform rises to the top of the machine for easier loading and unloading.

At a low initial cost the Aja-Lif is available in sizes to fit any production line. Aja-Lif . . . for traction motor and generator parts, maintenance of way equipment, air brake units, signal equipment, electrical parts and other metal parts that must be cleaned before overhaul and repair.

SEND A COPY OF BULLETIN 704-AL

Name ..... Title .....
Firm Name .....
Street .....
City ..... Zone ..... State .....

magnus

RAILROAD DIVISION

MAGNUS CHEMICAL CO., INC.

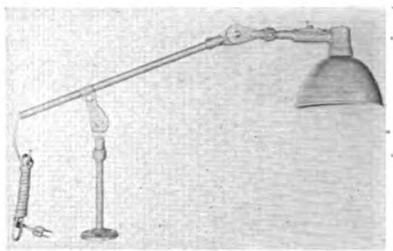
77 South Avenue Garwood, N. J.

(Continued from page 102)

8 multiflame heating heads, and 8 extensions.

The aluminum handle is designed to fit either hand, is located for proper balance, and distributes the torch weight over all the fingers of the gripping hand. In addition to the strength and durability of the stainless steel used in making the torch there is its property of retarding heat conduction which keeps the torch cool. The hose connections are offset to reduce the pull of the hoses at the rear of the blowpipe.

A locking device utilizing a circular spring in the head coupling nut permits quick change of welding heads without a wrench and yet allows the heads to be swiveled without releasing them or extinguishing the flame. Heads range from 2 to 300 cu-ft per hr capacity. *Linde Air Products Company, Division of Union Carbide & Carbon Corp., 60 East 42nd street, New York.*



Lighting Fixture

These Localite fixtures are for machine tool, assembly and inspection operations. Improved articulation makes possible directing the light reflector in a thousand positions, according to the manufacturer. Universal arm joints with large frictional disc bearing surfaces provide a 135-deg angle bend. Collar disc joints rotate 180 deg. Various style reflectors include heavy duty industrial type sockets. Wiring is SPT-2 18/2 heavy duty plastic rip cord. *Fostoria Pressed Steel Corporation, Fostoria, Ohio.*

Guillotine Type Cable Cutters

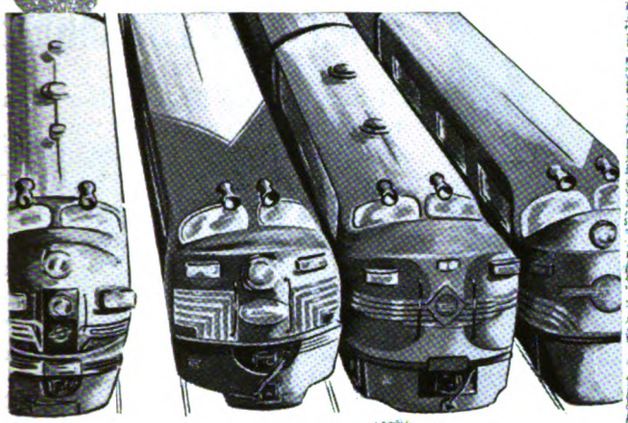
This series of cutters, available in three models, can be used to cut bundles of cables containing various combinations of structural, electrical, and hydraulic lines. Similar in overall arrangement, the three types vary primarily in the diameter of the cables they are able to cut.

Model 209 for 9/16 in. diameter cable, is powered by electrical primer only. It is provided with shear-type safety pins which prevent blade movement before firing. It has expendable parts and can be supplied with reload kits.

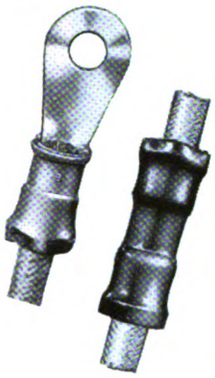
Model 247 for 1⅛ in. maximum diameter cable, is electrically fired and the case-hardened steel knife is powered from a .38 calibre propellant cartridge. The unit

(Continued on page 117)

Right from the word go!



. . . There is a reason why most manufacturers of Diesels and rolling stock specify AMPLI-BOND for electrical connections in wire sizes from #8 to 4/0. It's because AMPLI-BOND Terminals and Connectors are designed to fill the specialized requirements for railway use. They are rugged enough to stand up under constant use and pre-insulated to eliminate wrapping, tape or spaghetti. The rough vinyl insulation is bonded to the terminal barrel; won't slip off or crack under crimping pressure. Hand Hydraulic and DYNA-CRIMP tools have positive crimping action to make fast, high tensile strength crimps.



Ampli-Bond

Terminals and Connectors and crimping tools for wire sizes #8 to 4/0.

AMP

AIRCRAFT-MARINE PRODUCTS, INC.

2100 Paxton St., Harrisburg, Pa.

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Aircraft-Marine Products of Canada, Ltd.
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Toronto 12, Ontario, Canada
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It's Amazing!

THE TOLEDO NO. 78 VERMETTE POWER DRIVE

★ **WEIGHS ONLY 75 POUNDS**
A real heavy-duty, lightweight

★ **RAPID, POSITIVE CHUCKING**
Grips like a pipe wrench — self centering

★ **CONSERVES TIME AND ENERGY**
The most advanced and versatile machine on the market

★ **BETTER BUILT TO LAST LONGER**
No belts — sturdy — powerful

A time proved, PORTABLE power drive providing effortless cutting, threading and reaming of pipe and conduit . . . a worthy addition to "TOLEDO's" well known line of quality pipe tools. Fully guaranteed. Handles up to 2" sizes . . . grips, tightens and centers pipe automatically, forward or reverse. It's the lightest portable power drive of its kind. And remember . . . if it bears the "TOLEDO" label . . . you know it's a dependable product.

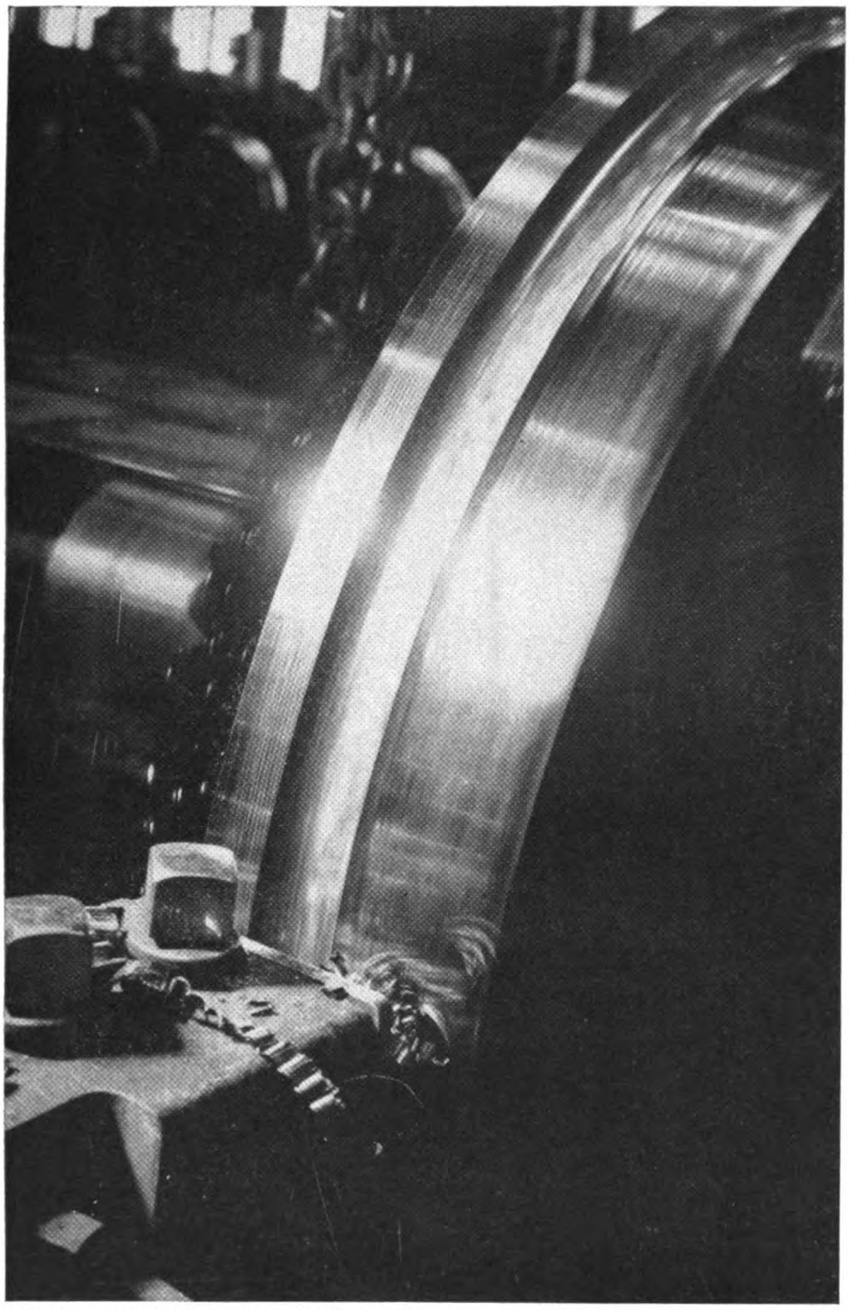
Write today for new free bulletin with conclusive proof of superiority. Your "TOLEDO" supplier has all the facts.

TOLEDO PIPE THREADING MACHINE COMPANY
TOLEDO 4, OHIO

BUILDERS OF THE WORLD'S FINEST PIPE TOOLS

TOLEDO®

PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES



ILLINOIS CENTRAL RAILROAD. Close-up of the tracer actuated profiling tool cutting new contour on a wheel on the NILES 52″ car wheel lathe in the IC's Burnside Shops (Chicago). Note the depth of cut, 24 tapes.

NILES LATHE

In these outstanding wheel shops, Niles 52″ hydraulic car wheel lathe can turn set in less than 20 minutes

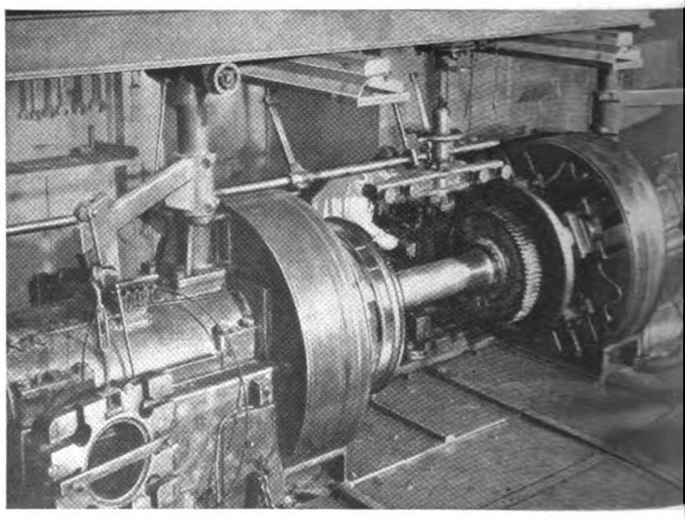
"From floor-to-floor in less than twenty minutes, compared with old, slow lathe's hour and 20 minutes!" is a typical report from these users of the Niles 52″ hydraulic car wheel lathe with profiling attachment.

Designed for heaviest duty with a wide range of spindle speeds up to 25 rpm, this lathe can be used with either tungsten carbide or high speed steel tools.

Extra Wheel Mileage

By switching to cutting with carbides, these shops are also getting thousands of extra miles of wear from many wheel sets. That is due to the carbide tool's slicing right through spots of excessive hardness, while the high speed steel tool must cut below the spot into softer metal, taking off more surface than required by the depth of the concavity.

If your wheel shops are still returning wheels the slow, old-fashioned way, consider carefully how much a modern Niles wheel lathe will save you in manhours, wheel inventory and replacement of wheels.



UNION PACIFIC RAILROAD. When this Niles Wheel lathe tungsten-carbide tipped tools and profiling attachment was installed in the UP's Los Angeles Shop, wheel re-turning time was cut to about 20 minutes.

(Continued from page 106)

is suitable for reuse through approximately 25 operations. Reload kits containing necessary expendable parts are available.

Model 174 for 2¼ by 1½ in. maximum opening, is available for either remote electrical firing or primacord actuation from a detonator-safe initiator. Other sizes of cables or lines and various specific requirements can be accommodated by modifications of these cutters. *Beckman & Whitley, Inc., 918 E. San Carlos avenue, San Carlos, Cal.*

Fault Detecting Electronic Instrument

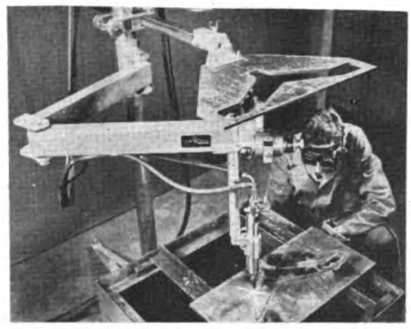
The Auditec is a portable instrument for detecting faults and bearing failures in motors, and machinery, leaks in pipelines and surface flaws in many materials. With it, the operator can hear sounds of impending trouble and quickly trace them to the exact source.

The unit consists of a sensitive contact-microphone encased in a probe handle, a three stage amplifier and plug-in headphones. Visual measurement can be made by adding an output meter to the outfit. It is powered by standard batteries. *John Ould, (U.S.A.) Ltd., 519 South Fifth avenue, Mount Vernon, N. Y.*

Plastic Steel

Devcon, consisting of 80 per cent steel and 20 per cent plastic, can be used for making tools, drill jigs, machine fixtures, chuck jaws, nests and other items. Two hours after the addition of a hardening agent, the mixture of steel and plastic becomes a rigid, steel-like mass. No heat or pressure is required. Once hard, it can be sawed, threaded, drilled or ground on metal-working equipment.

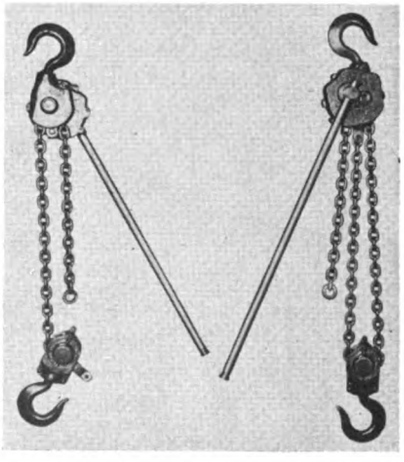
Devcon A is a putty and can be applied to a vertical surface and will not run or sag. Glass fabric and tailoring are not required. Devcon B is a viscous liquid that can be poured. There is practically no shrinkage during hardening, and, once set, they are durable and permanent. *Chemical Development Corporation, 200 Endicott street, Danvers, Mass.*



Flame-Cutting Machine

The No. 42 Camograph, featuring a permanent magnetic roller, cuts any shape up to a full 42 in. circle and straight lines to 92 in. It is said to be an ideal tool for repetitive, accurate shape cutting with a single torch. The flame cutter also serves as an auxiliary unit to supplement output of larger shape-cutting machines.

The permanently magnetized tracing roller accurately follows a metal template of the most intricate shape. Its motor drive shaft is equipped with a simple worm-gear drive, there being no couplings, pulleys or belts. The device is portable and will shape-cut to any practicable thickness. *Air Reduction Sales Company, Division of Air Reduction Co., 60 East 42 street, New York 17.*



Ratchet Lever Hoists

Two coil chain ratchet lever hoists, models L-1½ with a capacity of 1½ tons and LD-3 having a capacity of 3 tons have been made available. They are fitted with levers instead of gears. These hoists with 85 per cent efficiency, take only 60½ lb of handle pull to lift a 1½ ton load and 74 lb to lift 5 tons.

The devices are made either in malleable iron or aluminum alloy. Model L-1½ in malleable weighs 26½ lb and 20 lb in aluminum. Model LD-3 is 34½ lb in malleable iron and 28 lb in aluminum. The hoists are tested for 100 per cent above capacity.

Hooks for the units are made of drop-forged alloy and will not bend according to the manufacturer. The housing can withstand heavy impact loads and will withstand rust. The flexible coils can wrap in any direction and will not kink or fray. A free-chain lever allows the chain to be pulled through the hoist head for adjustment when not under load. *Coffing Hoist Division, Duff-Norton Company, Danville, Ill.*

Pipe Threader Power Drive

The No. 78 Vermette power drive features heavy-duty construction with compactness and light weight. It can be used for cutting, reaming, threading and fitting operations. The chuck, which can be set up in a few seconds, handles ¼- to 2-in. pipe and conduit.

The device utilizes a complete gear train with hardened alloy steel gears mounted on ball bearings. It has a variable speed 115-volt, reversible, air cooled a-c or d-c motor with ball-bearing mountings. *Toledo Pipe Threading Machine Company, 1445 Summit street, Toledo 4, Ohio.*

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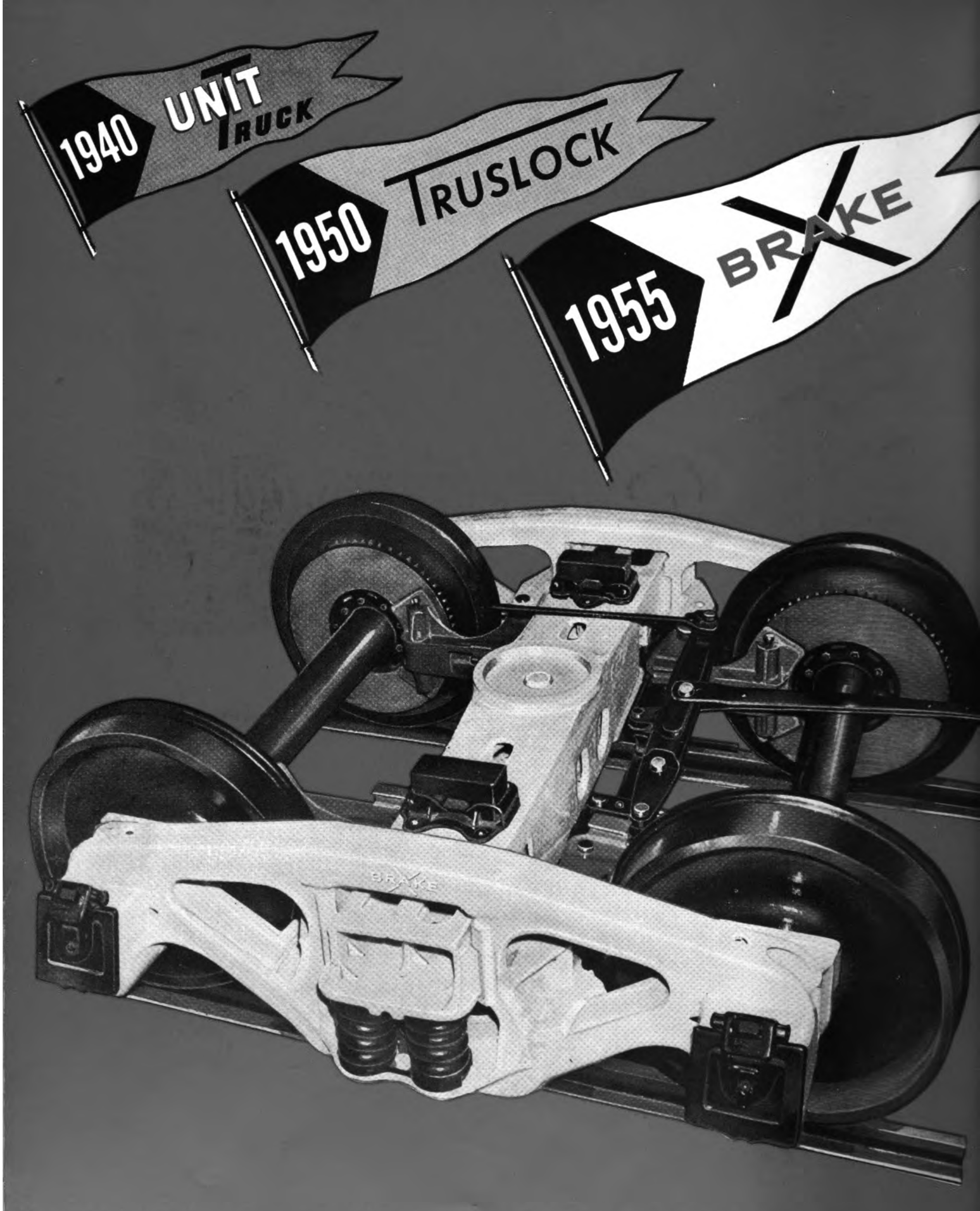
APPLIANCE COMPANY



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Founded in 1832 as the American Rail-Road Journal

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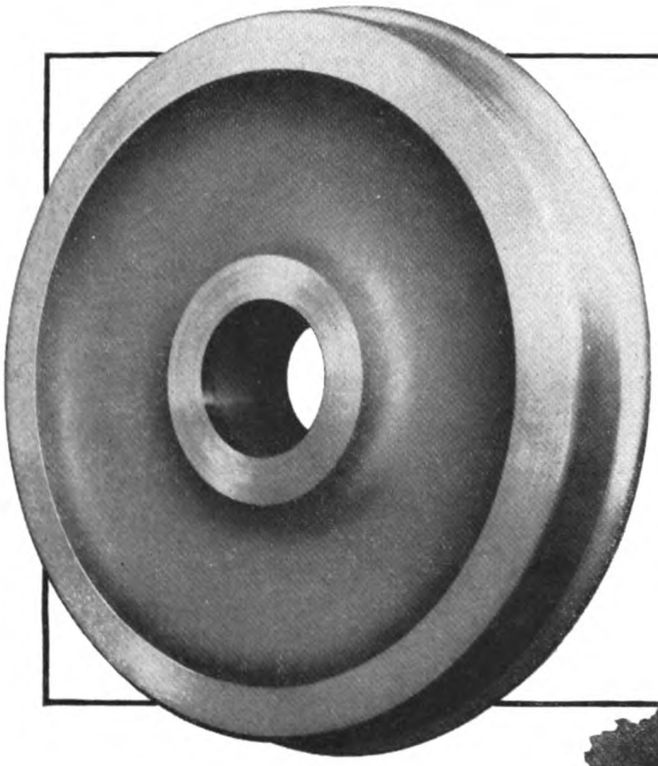

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UNITED STATES STEEL

WROUGHT STEEL WHEELS

USS Multiple-Wear *Wrought* Steel Wheels deliver more ton miles per dollar than any other type wheel—for two reasons. Because they are made of steel, they possess the strength and toughness to bear heavy loads, the hardness to resist wear, and the ductility to minimize sudden brittle fractures. Secondly, this excellent combination of inherent properties is improved by forging, rolling, and control-cooling, resulting in a wheel of unequalled soundness. No other wheel is so well prepared for heavy loads, severe braking and high speed impacts. No other wheel requires so little maintenance, gives such long, dependable service at comparable cost.

USS Multiple-Wear *Wrought* Steel Wheels are produced for all types of railroad applications including Diesel locomotives, electric and steam locomotives, passenger, express, and heavy-duty freight cars.

Two strategically-located, complete wheel shops are ready to fill your orders for *Wrought* Steel Wheels: McKees Rocks (Pittsburgh), Pennsylvania shop, serving the East and Southeast, and the Gary, Indiana shop, supplying the Western and Southern Lines.

UNITED STATES STEEL CORPORATION, PITTSBURGH, PA. • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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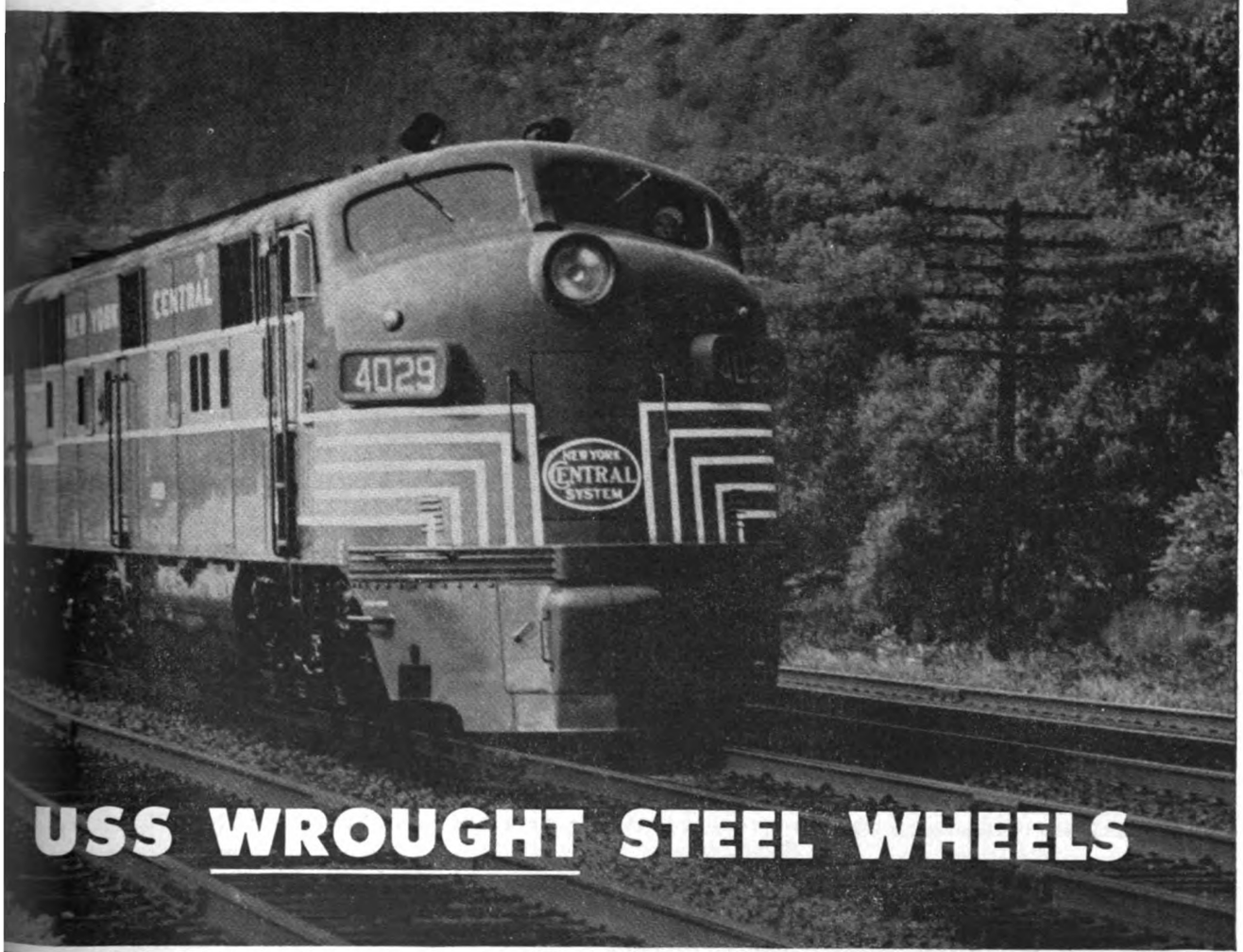


USS WROUGHT STEEL WHEELS

UNITED STATES STEEL

NEWS

28 RRs in Labor Dept. Apprenticeship Program

More than 2,000 apprentices from 28 railroads are in training in the national apprenticeship program to develop craftsmen in maintenance shops, according to the U. S. Department of Labor's Bureau of Apprenticeship.

They are being trained in railroad shops and classrooms for all-around work as electricians, machinists, sheet metal workers, boilermakers, carmen, mechanics and blacksmiths, E. E. Goshen, deputy director, reported. He said "it is anticipated that all American railroads will eventually take part in this national program."

British Railways Building Test Track

A testing installation for work with both track and equipment developments is being built by the British Railways at a cost of $1,000,000. Nearly four miles of curved and straight test track are being installed at the test plant located between Birmingham and Derby. The plan will aid in obtaining detailed information concerning the performance of locomotives and passenger and freight cars over tracks in various states of wear and at wide ranges of speed.

A Railways spokesman reported that "such information will be of great inmportance in connection with the progressive introduction of diesel and electric equipment under the modernization program and will help to insure the attainment of the highest possible standards of safety and comfort in the design and maintenance of vehicles and tracks." Excessive costs and interference with normal traffic made difficult the use of existing tracks for full ranges of accurate and detailed studies.

The curves will be used to study the movement of vehicles from the dual standpoint of vehicle design and behavior on sharp curves, and of the layout and maintenance of the tracks themselves. Particular conditions of wear can be artificially created and controlled, and any new track component or rolling stock can be tested without having to relay a section of line in revenue service.

Ages of Cars in Service

Only one-third of the freight cars in service at the beginning of this year were less than 10 years old. More than 43 per cent were over 20 years old and more than 22 per cent were over 30 years old. This showing was pointed up in calculations made by the ICC's Bureau of Transport Economics and Statistics from figures supplied by the American Railway Car Institute. As to passenger-train cars, it was shown that less than 5½ per cent of the fleet was built during the past five years, while two-thirds of it comprised cars more than 25 years old.

A. C. Browning Dies

A. C. BROWNING, former secretary, Mechanical Division, Association of American Railroads, died October 1 at Tryon, N. C.

C. K. Steins Receives Henderson Medal

C. K. Steins, mechanical engineer, Pennsylvania, received the 1955 George R. Henderson medal of the Franklin Institute of Philadelphia. The medal is awarded for meritorious inventions or discoveries in the railroad engineering field. Mr. Stein's contributions toward increased railroad efficiency have included both motive-power and rolling-stock developments.

High-tensile-steel passenger cars with a unique system of air conditioning and ventilation ducts, high-capacity depressed-center flat cars, and a load retainer and separator for box cars have been among Mr. Stein's rolling stock developments. He has designed high-speed, multi-cylinder, non-articulated steam freight locomotives and recently has been engaged in work on an entire low cost, lightweight, high-speed passenger train.

A 1913 graduate of the Stevens Institute of Technology, Mr. Steins entered Pennsylvania service in 1919 and became the mechanical engineer in 1941. He is a member of the Mechanical Division of the AAR, chairman of the Railroad Division of the ASME, and a member of the Newcomen Society and the Franklin Institute.

PERSONAL MENTION

Canadian National

ERIC WYNNE, general superintendent of motive power and car equipment, Western region, at Winnipeg, Man., appointed chief of motive power and car equipment at Montreal. *Born:* Stafford, England, April 10, 1899. *Career:* Began as call boy with Grand Trunk Pacific (now CNR) in 1916. Served as machinist apprentice, machinist, mechanical inspector and mechanical engineer, becoming general superintendent motive power and car equipment, Atlantic region, at Moncton, N. B., in January 1949 and transferring to the Western region at Winnipeg in June 1951.

KEITH E. HUNT, mechanical engineer at Montreal, appointed general foreman, Point St. Charles (Montreal) diesel electric shop.

J. A. TAIT appointed road foreman of engines, Toronto Terminals. Headquarters, Toronto.

W. J. WALSH, locomotive foreman at Capreol, Ont., appointed master mechanic at Capreol.

W. R. CHALMERS, locomotive foreman at Hamilton, Ont., appointed locomotive foreman at Capreol.

R. DOUBROUGH appointed electrical foreman at motive-power shops, Stratford, Ont.

Canadian Pacific

ARTHUR BAYNHAM, division master mechanic at Lethbridge, Alta., retired.

F. G. NOSEWORTHY, division master mechanic, Kenora division, transferred to Lethbridge, Alta.

Central Vermont

ALFRED A. SOULLIERE, general foreman, car department at St. Albana, Vt., retired.

Chicago, Burlington & Quincy

JOHN D. SCHROEDER, general foreman at Galesburg, Ill., appointed to newly created position of assistant general superintendent of motive power, Lines East.

J. D. REZNER, superintendent car department at Chicago, appointed mechanical assistant to vice-president—operation.

D. V. HON, mechanical inspector, appointed superintendent car department.

C. E. MELKER, general superintendent motive power, retired.

Chicago, Rock Island & Pacific

ROBERT F. NEWTON appointed electrical engineer at Chicago as announced in the November issue. *Born:* September 4, 1917. at Spokane, Wash. *Education:* Washington State College (1942). *Career:* Became assistant to superintendent, Great Northern. in 1942, and traveling engineer in 1943. Appointed assistant superintendent electric operations in 1947. Entered service of Rock Island January 1, 1955.

Erie

LAWRENCE H. CREIGHTON, shop superintendent at Susquehanna, Pa., coach shop. retired.

DAVID H. DECKER, division car foreman at Jersey City, N. J., appointed shop superintendent at Susquehanna, Pa., coach shop.

Missouri Pacific

North Little Rock, Ark.

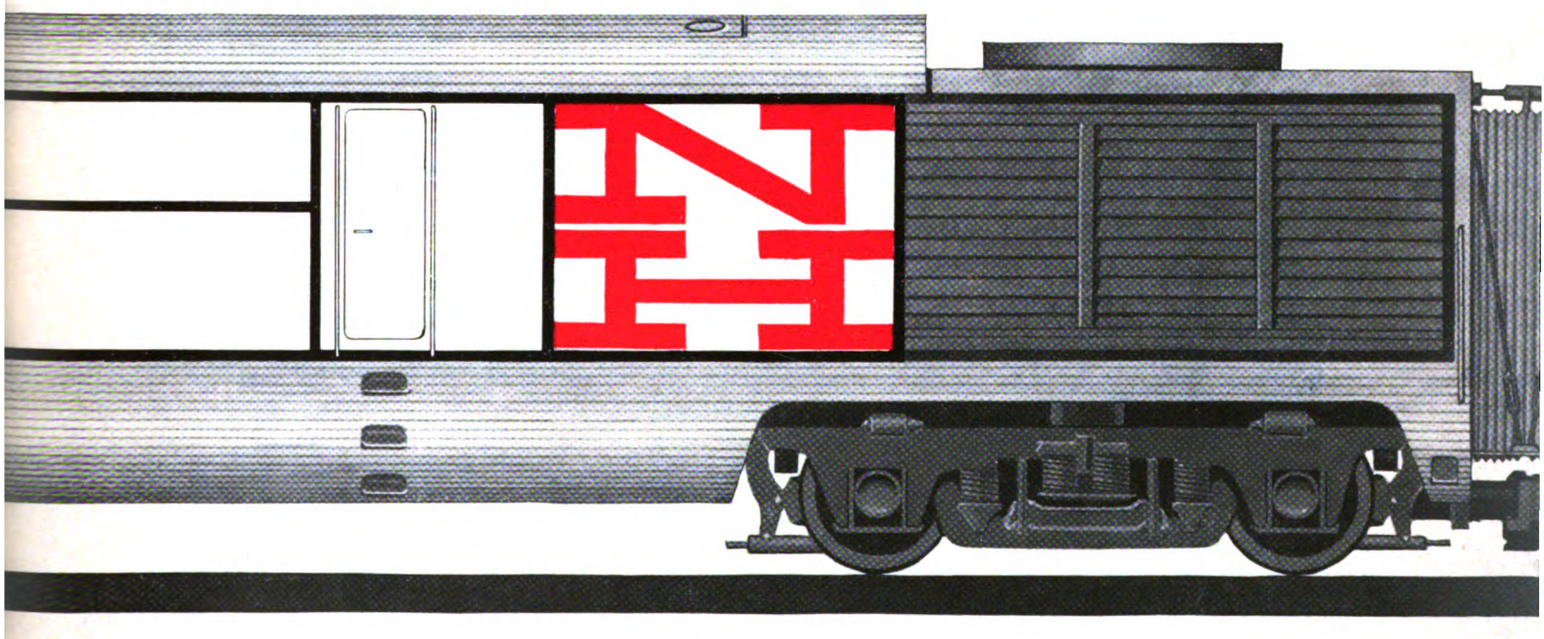
W. F. DUNCAN resumes duties as terminal master mechanic after a leave of absence because of illness.

G. W. NIEMEYER, acting terminal master mechanic, resumes as road master mechanic.

(*Turn to page 10*)

Tomorrow's high-speed locomotive

Merchant



Single Engine Power Plant
This single engine power plant not only supplies high horsepower for traction but also delivers ample power for full auxiliary load—train service, train lighting, heating and air conditioning as well as power for food service.

Both Diesel and Electric
The Speed Merchant's ability to operate as either a diesel-electric or straight electric locomotive enables the New Haven to make the entire trip from Boston to the Grand Central Terminal without changing motive power.

High speed. Proven power. Simple maintenance. These are the advanced features of the new Fairbanks-Morse Speed Merchant designed to put profit back in passenger service.

FAIRBANKS-MORSE
a name worth remembering when you want the best

DIESEL LOCOMOTIVES AND ENGINES • RAIL CARS AND RAILROAD EQUIPMENT • ELECTRICAL MACHINERY • PUMPS • SCALES • WATER SERVICE EQUIPMENT • MAGNETOS

PERSONAL MENTION

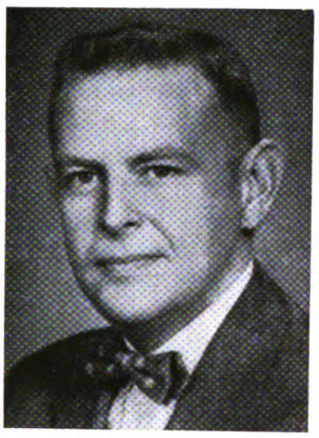
(Continued from page 6)

New York Central

O. L. EASTON appointed general superintendent of shops, Beech Grove (Ind.) shops.

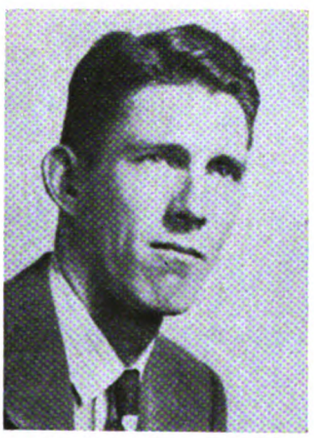
New York, New Haven & Hartford

New Haven, Conn.



Donald S. Onnen

DONALD S. ONNEN appointed assistant chief mechanical officer in charge of engineering and mechanical matters entailed in application of road's new low-center-of-gravity equipment. Formerly application engineer, General Electric Company at Erie, Pa.



William A. Baker

WILLIAM A. BAKER appointed assistant chief mechanical officer in charge of locomotive maintenance. Formerly general diesel supervisor of Clinchfield at Erwin, Tenn.

Southern

JOHN L. STUBS appointed general diesel instructor at Knoxville, Tenn.

JAMES C. WADDLE appointed general diesel supervisor at Knoxville, Tenn.

JAMES C. BARLOW appointed general diesel supervisor at Birmingham, Ala.

ARCHIE L. ADAMS, roundhouse foreman at Huntingburg, Ind., appointed general foreman at Sheffield, Ala.

CARLISLE H. PARTLOW appointed general foreman enginehouse at Alexandria, Va.

LEROY G. STEARNS appointed assistant foreman freight car repairs, Hayne shop, Spartanburg, S. C.

WILLIAM E. HEDGEPATH appointed assistant foreman coach yard at Atlanta, Ga.

DONALD B. BAILEY, JR., appointed assistant foreman erecting shop at Atlanta, Ga.

Obituary

DANIEL A. CARROLL. 56, master mechanic of the Illinois Northern, died September 26.

A. C. MELANSON, chief of motive power and car equipment of the Canadian National at Montreal, Que., died October 14.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE NOVEMBER ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horsepower*	*Service*	*Builder*
Central of New Jersey	6[1]	2,400	Road	Fairbanks, Morse
Great Northern	20[2]	.....	.....	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Alaska	50[4]	70-ton flat	Warren Car
Chicago & Eastern Illinois	50[5]	Flat	Company shops
Chicago, Rock Island & Pacific	225[6]	70-ton covered hopper	Pullman-Standard
Delaware & Hudson	500[7]	50-ton box	Pullman-Standard
Delaware, Lackawanna & Western	400[8]	50-ton box	ACF Industries
	500[8]	50-ton box	Magor Car
Elgin, Joliet & Eastern	25[9]	Caboose	International Ry. Car
Great Northern	1,000[10]	Box	Company shops
	25[10]	19,000-gal. tank	ACF Industries
New York, Chicago & St. Louis	100[11]	Flat	Company shops
Norfolk & Western	500[12]	70-ton hopper	Bethlehem Steel
	500[12]	70-ton hopper	Greenville Steel Car
	1,500[12]	70-ton hopper	Company shops
	500[12]	box	Pullman-Standard
	50[12]	70-ton covered hopper	Pullman-Standard
Norfolk Southern	100[13]	50-ton gondola	Magor Car
Northern Pacific	100[14]	70-ton mech. refrig.	Pacific Car & Fdry.
St. Louis Southwestern	700[15]	50-ton box	Pullman-Standard
Wisconsin Central	25[16]	DF box	Company shops
	25[16]	Box	Company shops

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Canadian National	1	Rail diesel (RDC-3)	Budd
Chicago & Eastern Illinois	1[17]	Rail diesel (DC-1)	Budd

[1] To cost over $1,500,000. Deliveries expected in February and March.
[2] To be acquired in 1956.
[4] Cost, $496,000. For February delivery.
[5] For piggyback service.
[6] For January and February delivery.
[7] Estimated cost, $3,750,000. Half the cars will be 50½ ft; half, 40½ ft. D elivery scheduled for second quarter of 1956.
[8] For delivery during the first half of 1956.
[9] Cost, $15,750 each. Deliveries scheduled to begin in February; completed by May 1.
[10] Approximate cost of box cars, $8,000,000. To be constructed next year.
[11] Estimated unit cost, $7,000.
[12] Deliveries of Bethlehem and Greenville cars expected early in 1956. Work on company built hoppers to begin next June.
[13] To be leased from Human-Michaels Co. Cost, $600,000. For February delivery.
[14] Estimated unit cost, $22,518. Deliveries expected to start this year.
[15] Cost, $5,500,000. Half to be 50 ft, with 15-ft double doors; half, 40 ft, with 8-ft single doors. Nailable Steel flooring in doorways.
[16] Box cars to be built next year. Road authorized to acquire also 15 covered hopper cars.
[17] To have been delivered early in November.

NOTES:

Chesapeake & Ohio.—Directors have authorized purchase of 1,000 hopper cars and 1,000 gondola cars at a cost of $15,300,000.

Erie.—Will order six 1,600-hp general purpose switchers and four 1,200-hp yard switchers.

Lehigh Valley.—LV expected to order 300 freight cars as this issue goes to press.

New York Central.—The NYC will order 14,750 freight cars for earliest possible delivery, at a cost of $117,855,000, Alfred E. Perlman, president, has announced. Included will be 5,000 box cars, 9,250 70-ton self-clearing hopper cars, and 500 70-ton covered hopper cars.

Norfolk & Western.—Directors have authorized purchase of 25 general purpose diesel locomotive units in addition to freight cars listed above. To be of 1,600 hp or its equivalent.

Reading—Will purchase before the end of the year 400 box cars, 500 70-ton gondola cars, and 500 70-ton hopper cars.

Union Tank Car Company.—Will spend $10,000,000 on new cars of various types to be built in its own shops.

Virginian.—Placing orders for materials for 500—70-ton steel hopper cars to be built in its own shops, beginning the second half of 1956.

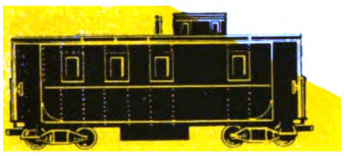
SUPPLY TRADE NOTES . .

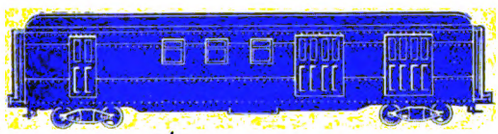
GENERAL MOTORS CORPORATION, ELECTRO-MOTIVE DIVISION.—*Frederick W. Walker, Jr.*, industrial sales manager, has been named manager of the Chicago region, succeeding *George W. Rukgaber*, transferred to the locomotive division of GM's overseas operations at New York. Mr. Walker's successor is *D. H. Queeney*, general service manager, who in turn has been replaced by *Frederick T. Battey*, manager of technical services. *T. B. Dilworth*, locomotive section engineer, has been appointed

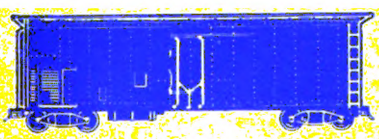
(Continued on page 14)

The only ½ to 5 KW Positive Gear Railway Generator Drive on the market

...now makes possible New efficiencies, New economies, New conveniences for ALL railroads







The new, small ½ to 5 KW Spicer ***Positive Gear*** Generator Drive makes available to caboose, baggage, refrigerator, and mail cars, all the advantages of steady, ample electrical current.

And the new Spicer Drive delivers the power for this ½ to 5 KW current with all the standards of efficiency and dependability established by the large, time-proved Spicer ***Positive Gear*** Generator Drive. More than 11,000 large Spicer Drives are now in use on over 70 railroads all over the world.

The Spicer Railway Generator Drive for radio, lighting, refrigeration and other electrical equipment consists of a very simple application of quiet, long-lived spiral bevel gear and pinion mounted at the end of a standard axle, thereby permitting rapid inspection and maintenance. The drive from the gears is positive and constant through Spicer Universal Joints and Propeller Shaft to the Spicer Safety Clutch which is attached to the generator. This safety clutch absorbs heavy shock loads and disconnects the drive line in case of an excessive overload, thus protecting the generator from damage.

Spicer Positive Railway Generator Drives can be quickly and economically adapted to new car designs and reconditioning jobs. Write for further details.

Manufactured and Sold by:

Spicer

DANA CORPORATION
TOLEDO 1, OHIO

SUPPLY TRADE NOTES

(Continued from page 10)

executive engineer of EMD, with headquarters as before at La Grange, Ill. *Max Ephraim, Jr.*, equipment engineer, succeeds Mr. Dilworth. *R. J. Hondlik*, branch sales manager at Robertson, Mo., and *J. E. O'Leary*, regional service manager at St. Louis, have been promoted to district sales managers in the St. Louis region.

■

N. E. Carlson

ACF INDUSTRIES, AMERICAN CAR & FOUNDRY DIV.—*Norman E. Carlson* has been appointed director of engineering. Mr. Carlson will continue also as works manager of the St. Charles, Mo., plant.

■

BEAR MANUFACTURING COMPANY—The *TZ Railway Equipment Company*, Chicago, has been appointed exclusive representative of Bear balancing machines for the railway industry.

■

G. F. Habach

WORTHINGTON CORPORATION. — *George F. Habach* has been elected vice-president in charge of engineering, including research and development.

■

SKF INDUSTRIES, INC.—*Ralph E. Campbell* has been appointed district manager at Pittsburgh, and *J. H. Sutherland*, district manager at Chicago. *Holton E. Fox* has been appointed field engineer, Pittsburgh district office.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
August, 1951	3,009,371	9,023	19,092	28,115	107,038
August, 1952	2,924,917	11,658	17,535	29,193	100,192
1953					
August	2,971,020	8,638	14,160	22,798	130,319
September	2,822,222	6,083	10,195	16,278	173,376
October	3,042,558	3,863	6,493	10,356	293,796
November	2,788,773	1,987	3,404	5,391	517,301
December	2,656,063	1,581	2,550	4,131	642,958
1954					
January	2,583,485	3,082	3,797	6,879	375,561
February	2,445,214	2,953	4,066	7,019	348,370
March	2,658,757	2,196	3,637	5,853	455,813
April	2,570,518	3,079	5,149	8,228	312,411
May	2,713,511	4,416	6,510	10,926	248,353
June	2,662,375	6,597	9,617	16,214	164,202
July	2,678,234	7,956	10,912	18,868	141,946
August	2,696,135	7,568	9,742	17,310	155,756
September	2,614,432	6,740	8,882	15,622	167,355
October	2,852,825	5,182	6,985	12,167	234,472
November	2,717,219	2,515	3,467	5,982	454,232
December	2,751,644	1,501	2,294	3,795	725,070
1955					
January	2,714,070	1,813	2,701	4,514	601,256
February	2,517,483	2,266	3,970	6,236	403,701
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of August		8 months ended with August	
		1955	1954	1955	1954
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	6,209	6,273	42,598	50,485
3-06	Total, Diesel-electric	36,729	32,807	280,218	256,324
3-07	Total, electric	792	652	5,895	5,152
3-04	Total, locomotive-miles	43,983	39,936	330,446	312,952
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,733	1,532	13,116	11,881
4-06	Empty, total	923	894	7,249	7,024
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	14,340	13,226	98,380	100,262
6-02	Total in oil-burning steam locomotive trains	2,995	2,584	15,861	18,019
6-03	Total in Diesel-electric locomotive trains	102,884	900769	789,232	706,341
6-04	Total in electric locomotive trains	2,360	2,009	17,996	15,833
6-06	Total in all trains	123,383	109,264	927,243	843,840
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.02	1.02	1.02
10-02	Loaded freight car-miles	42.4	41.0	42.6	40.7
10-03	Empty freight car-miles	22.6	24.0	23.6	24.0
10-04	Total freight car-miles (excluding caboose)	65.0	65.0	66.2	64.7
10-05	Gross ton-miles (excluding locomotive and tender)	3,021	2,930	3,012	2,887
10-06	Net ton-miles	1,397	1,309	1,361	1,273
12	Net ton-miles per loaded car-mile (M-211)	32.9	31.9	31.9	31.3
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	65.2	63.1	64.4	62.8
14	Averages per train hour (M-211):				
14-01	Train miles	18.2	18.6	18.7	18.8
14-02	Gross ton-miles (excluding locomotive and tender)	54,289	53,872	55,766	53,756
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	47.3	42.8	46.3	42.2
14-02	All	45.0	40.1	43.7	39.8
15	Average net ton-miles per freight car-day (M-240)	966	807	899	784
17	Per cent of home cars of total freight cars on the line (M-240)	41.7	52.9	46.9	53.8
	PASSENGER SERVICE (DATA FROM I.C.C. M-213)				
3	Road motive-power miles (000):				
3-05	Steam	1,515	2,168	11,458	19,076
3-06	Diesel-electric	20,745	21,521	162,818	167,349
3-07	Electric	1,316	1,393	10,538	11,187
3-04	Total	23,575	25,083	184,821	197,614
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	244,389	256,074	1,887,180	1,982,680
4-09	Total in coal-burning steam locomotive trains	8,553	10,624	64,842	93,837
4-10	Total in oil-burning steam locomotive trains	5,104	9,117	34,304	70,717
4-11	Total in Diesel-electric locomotive trains	216,002	221,181	1,667,612	1,694,334
12	Total car-miles per train-miles	9.95	9.84	9.81	9.66
	YARD SERVICE (DATA FROM I.C.C. M-215)				
1	Freight yard switching locomotive-hours:				
1-01	Steam, coal-burning	326,420	304,890	2,220,276	2,524,667
1-02	Steam, oil-burning	56,771	55,629	378,796	433,995
1-03	Diesel-electric[1]	3,797,711	3,322,684	28,358,285	26,127,379
1-06	Total	4,187,278	3,690,742	31,009,602	29,158,622
2	Passenger yard switching hours:				
2-01	Steam, coal-burning	7,842	10,956	69,487	98,964
2-02	Steam, oil-burning	6,568	6,432	40,937	38,701
2-03	Diesel-electric[1]	248,878	255,596	1,957,510	2,041,995
2-06	Total	289,750	297,406	2,273,988	2,388,515
3	Hours per yard locomotive-day:				
3-01	Steam	6.7	4.9	5.5	4.8
3-02	Diesel-electric	16.1	14.8	15.5	14.9
3-05	Serviceable	15.8	14.3	15.2	14.3
3-06	All locomotives (serviceable, unserviceable and stored)	14.3	12.3	13.4	12.3
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.68	1.68	1.64	71
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.73	.72	.75	.75

[1]Excludes B and trailing A units.

DAYTON RUBBER COMPANY.—*A. E. Meyer* has been appointed sales engineer, railway division, covering southern Ohio and Indiana, western Pennsylvania and northern Kentucky. *John J. Haher* has been appointed district manager, railway division, northern Ohio and Great Lakes region.

■

H. A. Withall

ENTERPRISE RAILWAY EQUIPMENT COMPANY.—*Harry A. Withall,* director of sales, has been elected vice-president and director of the company.

■

BRANDON COMPANY.—*T. C. Coleman & Son* of Louisville, Ky., has been appointed sales representative for railroads headquartered in Louisville and Nashville.

■

JOY MANUFACTURING COMPANY.—*William C. Russell* has become general manager of the St. Louis division. Mr. Russell was formerly sales manager and chief engineer of Dodge & Seymour Ltd., New York.

George Westinghouse, founder of the Westinghouse Air Brake Company, has been elected to the Hall of Fame for Great Americans at New York University. Inventor of the railroad air brake and other devices in the transportation and electrical fields, he died in 1914. A bronze likeness of him is being placed in the Hall of Fame colonnade on the Bronx campus of the university, along with those of 85 other persons honored since the award was first made in 1900.

MICRO-LUBE SALES.—*Walter Trefz* has been appointed technical service director at Dallas, Tex.

■

VAPOR HEATING CORPORATION.—*William Daley* has been transferred from St. Louis, to Richmond, Va.; *James Murray,* from Chicago to Atlanta, Ga.; *D. M. Campbell,* from Los Angeles to Chicago, and *H. H. Peplow,* from Chicago to St. Louis.

■

KOPPERS COMPANY, Wood Preserving Division.—*Don C. Smith,* assistant sales manager in charge of commercial sales, has been named manager of the sales department. He has taken over the sales duties of *Douglas Grymes, Jr.,* recently named a vice-president and executive assistant to general manager.

WYANDOTTE CHEMICAL CORPORATION, J. B. Ford Division.—*Stanley Johns* has been appointed district sales manager, with headquarters at St. Louis.

■

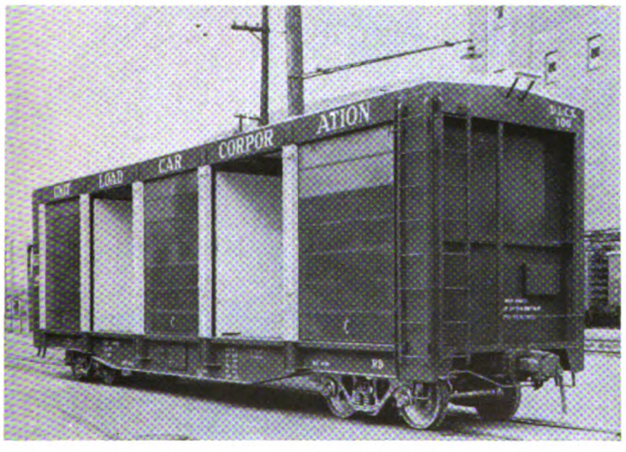
WESTINGHOUSE AIR BRAKE COMPANY.—*C. F. Hammer,* manager of engineering, Air Brake Division, has been appointed assistant director of engineering at Wilmerding, Pa.

■

STRATOFLEX, INC.—*Central States Industrial Supply Company,* Cleveland, has been made distributor in northeastern Ohio for high pressure hose assemblies made by Stratoflex.

Obituary

GEORGE W. FOX, president of the Davis Brake Beam Company, died September 15.



With fork lift equipment and palletized lading, this multi-door car was unloaded in ten minutes during a "Cost Reducton Clinic" in Chicago recently. The new car, built by International Steel Company, is divided into five compartments and has ten overhead garage-type doors—five to a side. Permanent bulkheads between compartments aim at reduc-

ing damage. The Unit Load Car Corporation plans to acquire 3,000 of the cars for lease to shippers at approximately $150 a month. The car makes extensive use of new materials, including a plastic sandwich panel in walls, floor, doors and ceiling, developed by the Haskelite Manufacturing Corporation

Simple, Permanent,

WRITE TODAY for manual describing simple, inexpensive installation steps and PARTS & PRICE LIST showing parts, quantity purchase prices. Sent immediately; no obligation.

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NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS

NMB has manufactured tens of thousands of oil seals for roller bearing cars and over 1,000,000,000 oil seals for AUTOMOBILES • TRUCKS • TRACTORS • AIRCRAFT • MACHINES • HOUSEHOLD APPLIANCES

Economic Answer to Hot Boxes

Alert officials on these and other railroads are proving the
NMB JOURNAL BOX LUBRICATING SYSTEM*
is the practical solution!

PROVE IT YOURSELF—MAKE THIS TEST

Equip 10 test cars with the NMB System. Prove conclusively to yourself that the NMB System is the practical solution to hot boxes.

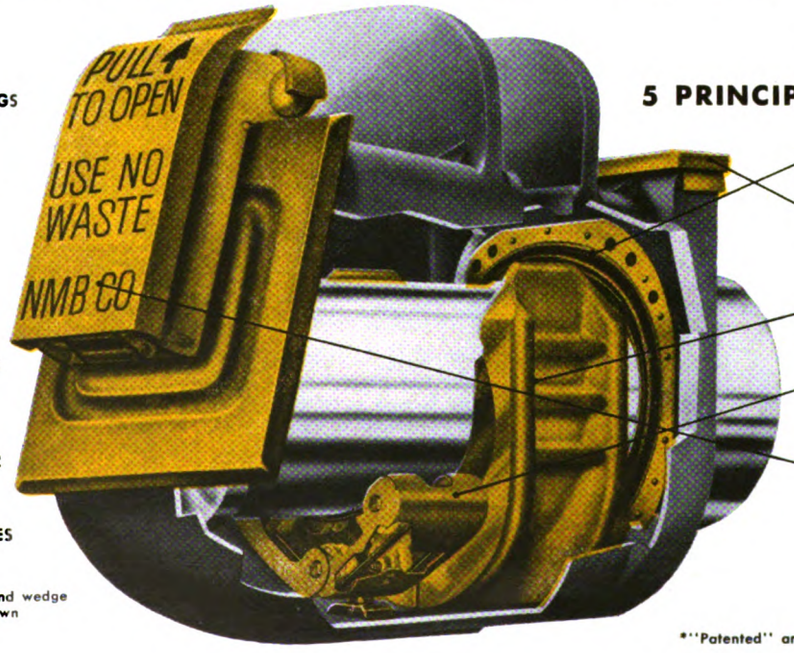
Operate under your most unfavorable conditions. Bearing end wear will be cut to an unbelievable 0.0006" per 1,000 car miles. Inspection will be required only once a month. Oil consumption will drop to about 1 oz. per 1,000 journal box miles. Hot boxes will be virtually eliminated!

The **NMB Sealed Journal Box Lubricating System** can achieve these results because it provides *positive* sealed oil bath lubrication of bearings at all speeds, while thoroughly excluding foreign matter from the journal box.

The exclusive NMB Oil Circulator lubricates bearings with ½ turn of the axle and causes bearings to run 50° cooler. The rear oil seal and leak-proof lid retain oil while excluding dirt, water, brine and snow. Journal guard bearings prevent impact damage to journals during humping, coupling, starting or heavy braking.

Installation is made in standard A.A.R. journal boxes. NMB Systems for 5" x 9", 5½" x 10" and 6" x 11" journal boxes can be shipped promptly.

- USES "LONG" SOLID BEARINGS
- QUICKLY INSTALLED WITHOUT ALTERATION
- ELIMINATES ALL HOT BOXES DUE TO INADEQUATE LUBRICATION
- REDUCES OIL CONSUMPTION 90%
- REDUCES INSPECTION TIME 90%
- VIRTUALLY ELIMINATES BRASS END WEAR, WEDGE AND BOX TOP WEAR
- RUNNING TEMPERATURES AVERAGE 50° COOLER UNDER FULL LOAD AT 60 MPH
- ELIMINATES VIRTUALLY ALL ACCIDENTS DUE TO HOT BOXES



Brass and wedge not shown

5 PRINCIPAL PARTS

A. OIL SEAL
B. DUST GUARD WELL COVER AND FILTER
C. JOURNAL GUARD BEARINGS
D. FREE-OIL CIRCULATOR
E. JOURNAL BOX LID AND WAFFLE GASKET

*"Patented" and "Patents Pending" 3570

EQUIPMENT... *New Ideas—New Uses*

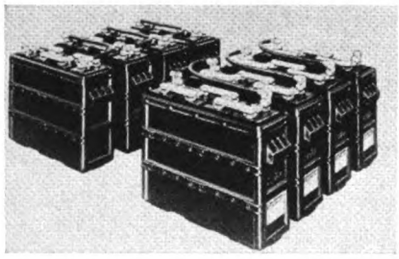
Improved Trackmobile

A Trackmobile has been developed which substitutes a locomotive-type side rod track drive for the less expensive chain drive used on the original model. Other features included in the new model are the disconnection of the track wheel drive when running on road wheels, provision to get on and off the track at any point whether on improved or unimproved road, the ability to tow carts or skids when on road wheels, and weather protection for the operator.

The rail wheels and the rear road wheels have 12 in. diameter mechanical and hydraulic brakes, internally expanding shoe type. The Trackmobile has electric sanders built into the frame for operation on wet or icy track. It has two head lights and a tail stop light for road use, and two combination running and rear lights for track use.

The new Trackmobile weighs approximately 8,900 lb. This weight goes to 9,900 lb if equipped with air braking to operate the brakes on the freight cars being moved. Other optional equipment includes heater, windshield wiper, vacuum horn, door, side windows, extra seat and cab light.

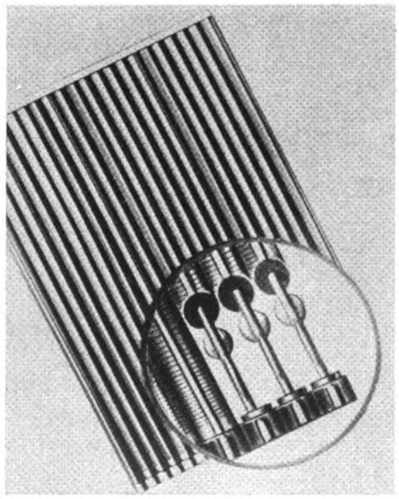
The new unit is recommended for pulling up to four loaded cars, but can move as many as six. Like the original model, it can move over 100 times its own weight, gaining the necessary traction by lifting and thereby taking the weight of one end of a car. It is by this means that the unit develops the same drawbar pull (12,815 lb) on rails as a locomotive weighing approximately 49,000 lb. On its rubber tires, where it has only its own weight for traction, maximum pull is 3,500 lb. Maximum speeds are 16 mph on track and 30 mph on the rubber tires. Conversion either way between rail and road operation takes 90 sec. *Whiting Corporation, Harvey, Ill.*



Diesel Starting Batteries

The tubing and tube sealers which encase the active material and grid spines of the positive plates of Exide-Ironclad diesel starting batteries are now made of polyethylene. This plastic replaces the rubber formerly used, and the change was made to lengthen battery life and increase capacity according to the manufacturer. The change was made after years of research and field testing. In 1953 polyethylene became standard in Exide industrial truck batteries, and in 1954 its use was extended to railroad air-conditioning and car-lighting service.

In diesel starting service a 20 per cent increase in capacity has been attained with no increase in overall space requirements. The finely slotted polyethylene tubes keep the active material in contact with the grid spines and permit it to be freely penetrated by the battery electrolyte. The tube sealers



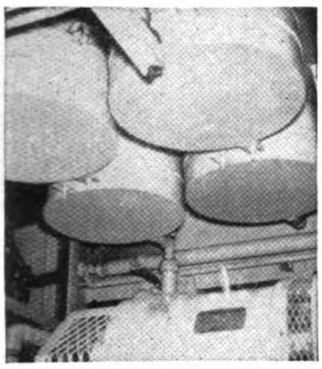
attached to the bottom of the tubes seal in the active material and prevent short circuits. Polyethylene is said to withstand a variety of working conditions and yet retain its elasticity and original slot dimensions. Nascent oxygen released during charging eroded the slots in the rubber tubes but does not attack polyethylene. The plastic is not subject to the uncertainties of foreign markets experienced with rubber. There can be very precise control of its physical and chemical properties. *Exide-Industrial Division, Electric Storage Battery Company, Box 8109, Philadelphia 1.*

Lightweight Car Seating

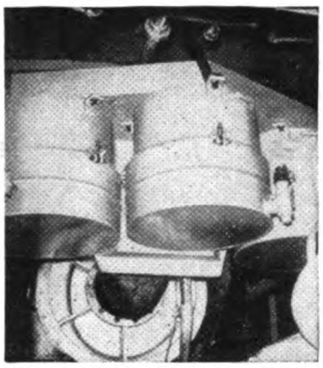
A passenger car seat developed for commuter type service cuts weight to 38-45 lb, depending on the model and has a new principle of reversibility. Because the seat is entirely symmetrical with respect to the seat and the back-rest portions, a simple rocking action changes the direction the seat faces. In this move what was the seat in one direction becomes the back in the opposite direction and vice versa.

The seating may be either cloth, plastic or leather. The cushioning medium is springs plus rubber. The tubing that forms the frame is either aluminum or magnesium. Wood framing is also available where desired for decorative reasons as in the dome portion of a coach. *Rockaway Transportation Seating, 400 West Madison, Chicago 6.*

How to reduce air filter maintenance without increasing engine wear



A 2 manifold, 4 element Air-Maze oil bath filter in use on Fairbanks Morse 2000 horsepower locomotive.



Air-Maze oil bath filter on ALCO 1500 horsepower road freight locomotive.

AIR-MAZE oil bath air filters cut *filter* maintenance without neglecting their primary job—that of stopping dirt and dust from damaging diesel engine parts. Air-Maze filters go at least three months without servicing. That's up to 24 times longer than panel-type filters! Yet, unlike many other types of filters, they cut maintenance with no loss of filter efficiency. Reports show that Air-Maze oil bath air filters *double,* sometimes *triple* power assembly life.

As a result, savings from both *engine* and *filter* maintenance pay for the cost of the filter in a year. Railroad after railroad is switching to this most advanced method of filtration. Already more than sixty railroads are using them. And one road will soon have fifty diesels using Air-Maze oil bath filters.

Air-Maze oil bath air filters clean air thoroughly because they scrub air in a bath of oil. And an oil-washed screen traps any remaining dust, passing only clean, oil-free air. For further information, call on us or see your locomotive builder. The Air-Maze Corporation, 25000 Miles Ave., Cleveland 28, Ohio.

AIR-MAZE OIL BATH FILTER MODELS AVAILABLE FOR THESE LOCOMOTIVES

MFR.	HP	SERVICE	MFR.	HP	SERVICE
Electromotive	800-900	Switcher	Alco-GE	2250	Rd. Switch
Electromotive	600	Switcher	Alco-GE	2250	Rd. Pass.
Electromotive	1000	Switcher	GE-Cooper Bess.	600	Switcher
Electromotive	1200	Switcher	B-L-H	800	Switcher
Electromotive	2000	Rd. Pass.	B-L-H	1000	Switcher
Electromotive	2250-2400	Rd. Pass.	B-L-H	1200	Switcher
Electromotive	1350	Rd. Freight	B-L-H	1500-1600	Rd. Switch
Electromotive	1500-1750	Rd. Freight	B-L-H	1500-1600	Rd. Freight
Electromotive	1500-1750	Rd. Switch	F-M	1000-1200	Switcher
Alco-GE	900	Switcher	F-M	1500-1600	Rd. Switch
Alco-GE	1000	Switcher	F-M	2000	Transfer
Alco-GE	1500-1600	Rd. Switch	F-M	2400	Trainmaster
Alco-GE	1500-1600	Rd. Freight			

AIR-MAZE The Filter Engineers

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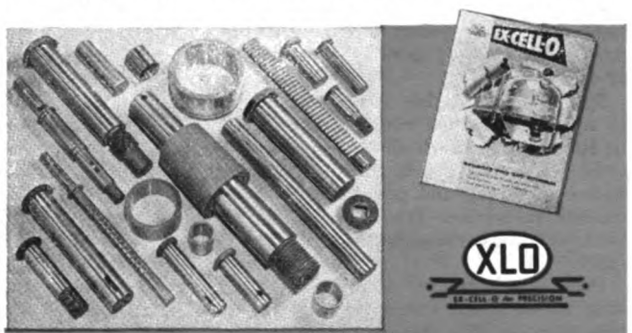
FOR LOCOMOTIVES, PASSENGER AND FREIGHT CARS

If your railroad pins and bushings are among Ex-Cell-O's wide range of standard sizes, you can save money and expedite delivery by ordering directly from stock. You'll get highest quality materials and workmanship, as evidenced by the fact that more than 200 railroads and equipment builders depend on Ex-Cell-O for hardened and ground steel pins and bushings. Order them directly from the convenient Ex-Cell-O Catalog.

For a complete listing of standard Ex-Cell-O Pins and Bushings for Diesel and steam locomotives and passenger car equipment, write for new Ex-Cell-O Bulletin 32559.



RAILROAD DIVISION
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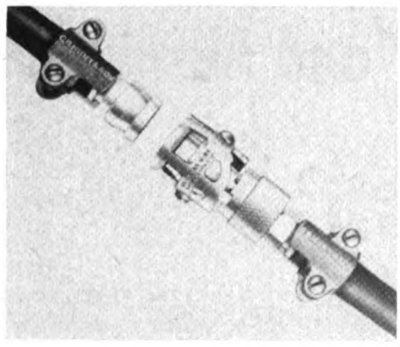
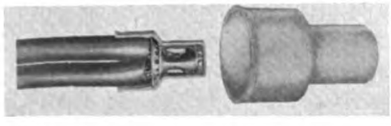


Valve Coupling

These safety-type, Quick-As-Wink detachable couplings lock in either the on, off or exhaust positions, and give the operator complete control of the air line.

In operation, after connecting the jaws of the valve half around the shoulder of the connection half, the operator advances the knurled brass sleeve to the on position. This permits line air to flow to the air-operated tool. Turning the sleeve to the right locks both the coupling and the valve in the on position, preventing accidental damage. Returning the brass sleeve to the off position exhausts air in the tool to the atmosphere automatically; traps line air in the sleeve; and permits the jaws of the coupling to be opened for connection to another tool. Turning this sleeve to the left locks the valve in the off and exhaust position.

The valve couplings are manufactured in ¼, ⅜, ½, and ¾ in. sizes for line pressures up to 250 psi. *C. B. Hunt & Son, Inc., Salem, Ohio.*



Splice-Cap Insulator

Construction of this insulator cap eliminates threading, wrapping or twisting of insulator during installation and provides excellent electrical and mechanical protection to spliced joints. These caps can be installed on very flexible wires in hot or cold weather.

Speed of installation is made possible by nylon construction with internal metallic retainer ring which allows the insulator to be quickly snapped in place over an installed splice cap and prevents accidental removal in service. Translucent body of insulator permits inspection of completed splice.

These insulators are available in two sizes which splice normal circuit wiring from two No. 18's through three No. 8's or two No. 6's. They are approved for building wire to 600 volts and in fixtures to 1000 volts in applications up to 105 deg C. *Buchanan Electrical Products Corporation, Hillside, N. J.*

Pipe Bender and Clamp

The Parker Model 824 tube bender is a bench mounted manual tool, available with a toggle clamp. This clamp, with simple handle action, is said to save time by quicker gripping of the tube to be bent. It is attached to the bender by inserting its swivel block pin into the third hole of the bender's radius block. Without shoe insert, the clamp takes tubing of 1½-in. od. Shoe inserts are used for smaller tubing. *Tube and Hose Fitting Division, Parker Appliance Company, 17325 Euclid avenue, Cleveland 12.*

Dual Sensitivity Voltmeter

The Hayward Model 610 voltmeter is for the measurement of structure-to-soil potential in corrosion control and cathodic protection work. It has low resistance and a method of correction of voltage drop in the circuit, and consists essentially of a voltmeter movement having two different sensitivities. D-c voltage ranges of 0-0.2/1/2/10/-20/100 are provided as well as a short position to short-circuit the movement when carrying the meter. No tubes or batteries are required.

In operation, the instrument is connected to a source of power, proper polarity selected, and a reading obtained. The push-button on the panel is then depressed and a second reading obtained. If the two readings are identical, the value read is the true open-circuit voltage accurate to within 1 per cent of full scale. If the second reading is less than the first, but not more than 5 per cent, the difference is added to the first reading and the sum is the true open-circuit voltage accurate within 2 per cent. For readings with a difference of more than 5 per cent, a special formula is utilized for the correct calculation.

The instrument is portable, weighing only 2½ lb. Its case is black plastic with a plastic carrying handle. *Associated Research, Inc., 3758 West Belmont avenue, Chicago 18.*

Grease Gun Filler Pump

The unit, designed to handle medium as well as light greases, attaches to any 25-lb or 50-lb original refinery container by means of three thumb screws. According to the manufacturer, the pump will fill a 1-lb capacity grease gun in 30 sec while eliminating contamination, air pockets and disagreeable mess of hand-filling methods. It is of steel construction.

A follower plate is said to assure positive prime in any weather and completely empties lubricant container. A self-closing filler socket prevents pumping of lubricant unless filler nipple of gun is inserted in socket. Machined piston with solid cork piston ring insures maximum lubricant output on every stroke. *Lincoln Engineering Company, 5702-14 Natural Bridge avenue, St. Louis 20.*

Quick-change Gaskets

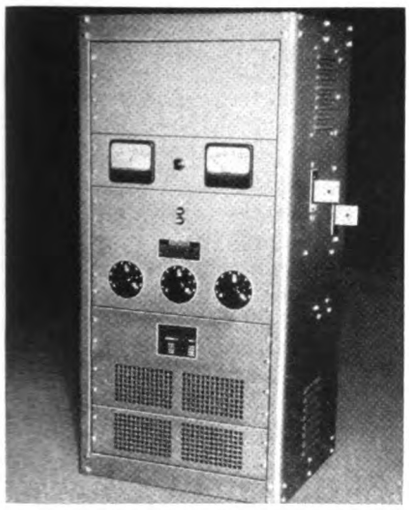
Gaskets can be changed out in the new Vapor-Steam-Life Flexible Conduit in less than five minutes during a station stop.

This is possible because the new gasket assembly has a pre-compressed spring enclosed in a non-corrosive stainless steel ferrule, which is easily slipped inside the gasket and placed into the body of the conduit, so that the two conduit bodies fit easily together without being held together under pressure while the two holding bolts are put in. All the car man needs is an open end wrench to make this change, he does not have to remove the heavy conduit and take it to the shop.

The gasket is made of a specially compounded steam-heat resistant rubber molded under pressure unto the tough flat woven asbestos face. Spring pressure compensates for gasket wear to keep the coupling steam tight.

Another important improvement on the Vapor-Steam-Life conduit is the addition of a stainless steel cap on the riding bear-

ing of the coupling which pivots on the new Oilite bearing insert. This makes the conduit flex easier with less strain on the gaskets thus giving longer gasket life. *Vapor Heating Corporation, 80 East Jackson blvd., Chicago.*



Germanium Rectifiers

These germanium rectifiers are available in several models in various amperes d-c output to meet most requirements. According to the manufacturer, they are said to offer greater efficiency over other types of conversion equipment.

Because there are fewer moving parts, maintenance costs are practically nil when compared to other large d-c power supplies. Since they require fewer components than conventional rectifiers, and because of their high efficiency, they are smaller in size, and can be installed in a smaller floor area. *Walker Division, Norma-Hoffman Bearings Corporation, Stamford, Conn.*

Engine Driven AC Arc Welders

Model GEA200 and GEA200L arc welders were designed for field production and maintenance welding applications. They are suited for use where a-c or d-c-a-c electrodes of 1/16 to 3/16 in. diameter are required. Rated welding current is 200 amp, 100 cycle, single phase with a 100 per cent duty cycle. Welding current range is 15 to 200 amp and open circuit voltage is 85. The welding arc is stable due to the high frequency of the welding current.

Both models provide 1 kw, 110 volt d-c auxiliary power. Model GEA200L can also be used to supply 4.5 kw, 110 to 220 volt, 60 cycle single-phase a-c power, identical to that furnished by normal power service lines.

The units are supplied with air-cooled 10-hp gasoline engines of aluminum-alloy construction for strength and rapid heat dissipation. Weight is 435 lb. Weatherproof construction permits continuous operation during practically any weather condition. *Air Reduction Sales Company, Division of Air Reduction Company, 60 East 42 street, New York 17.*

Engineering Print Holder

Plan Hold, a device for holding building or engineering plans, fits any existing plan rack or file and will hold 1 or 150 prints without the necessity of punching or drilling holes or mutilating plans in any way. Prints may be added or removed easily without disturbing other drawings.

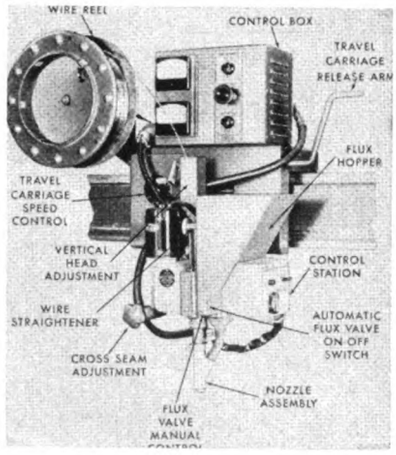
The holder is of satin-finished aluminum and all corners and edges are rounded. Soft plastic tips protect against scratching or marring of desks and reference tables. *Plan Hold Division, Air Comfort Company, South Gate, Cal.*

Welding Heads

Three new welding heads, developed for hidden or submerged arc welding, include new controls and accessories and two new power sources. The heads, LAF-3, LAF-4 and LAF-5, offer a choice of a-c or d-c current, field or shop welding, and constant *potential or variable voltage power source.* The controls permit a choice of instantaneous starting, either hot or cold for precision starting.

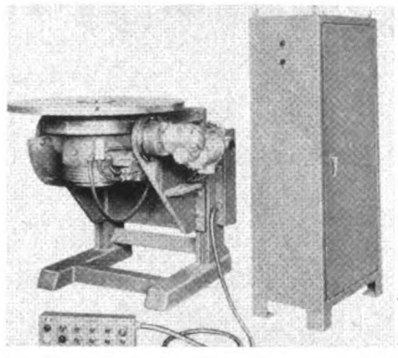
The heads permit easy adaptation to fixtures, either as a complete unit or as separate components. They can be universally positioned in any angle for roundabout welding, and can be positioned on seam while welding.

Electrodes in sizes from 3/32 to 7/32 in. are handled by one set of drive rolls, easily



accessible through a hinged door. A separate set of rolls handles 5/64 in. wire. Mounting equipment is available to give either a stationary mounting, mounting on a self-propelled travel carriage, or on a self-propelled tractor.

A power source has been added and gives 750 amperes continuous duty a-c power. It has a power driven reactor control for setting current from remote switches on the welding head control box. A d-c power source of 750 amperes continuous duty is also available. *Lincoln Electric Company, 22801 St. Clair avenue, Cleveland 17.*

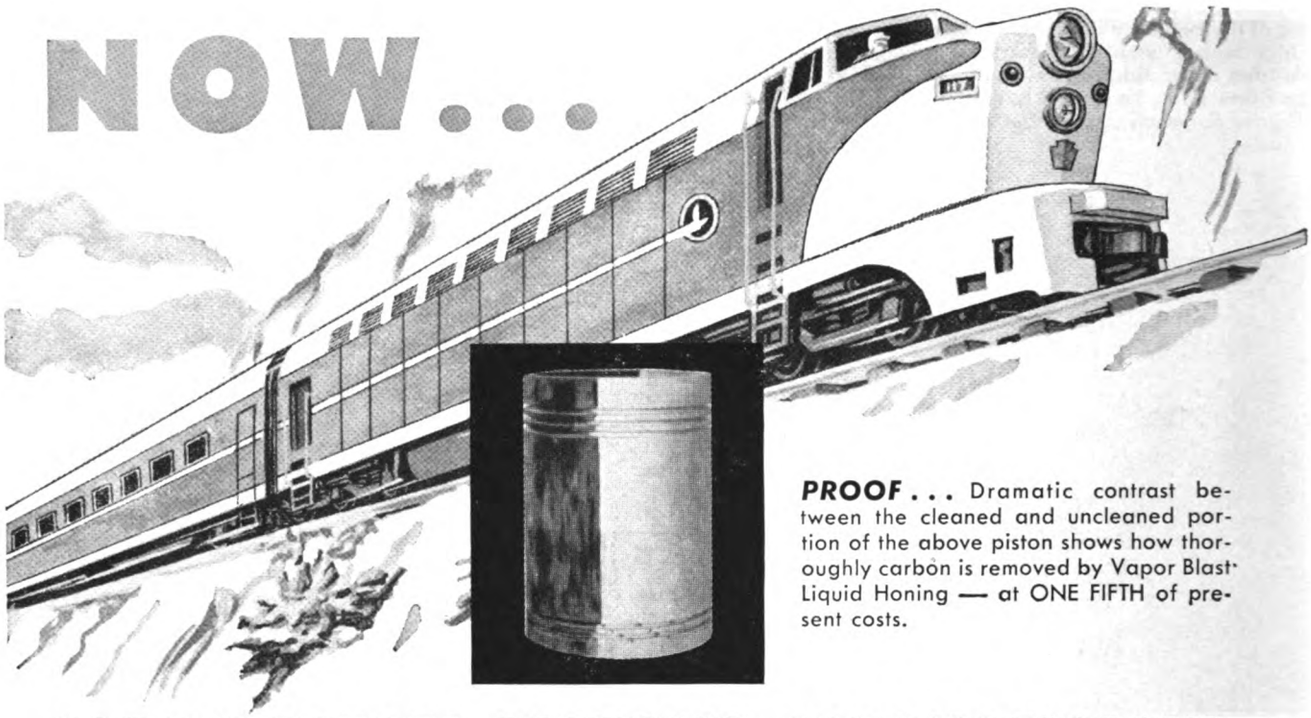


Welding Positioner

The WP-1 welding positioner is used in the automatic welding of a cylindrical or circular piece part. It provides the mechanical strength, and the rotation of the piece part about its axis, in front of the welding head. The unit is a rigid weldment supporting a hollow center table of 9 in. inside diameter and 40 in. outside diameter. It is equipped with feedback control and has a capacity of 2,500 lb, a 360-deg rotation, and a 135-deg table tilt.

Maximum table speed is 2 rpm with a minimum speed of 0.1 rpm. Rotation is accomplished with a ¾ hp d-c motor direct geared to the table. Stopping action is obtained by electronic armature regenerative braking. Positioner rotation tilt is driven by a 440 volt three phase, 60 cycle motor with micro-switches and a mechanical stop to prevent over-riding. *Sciaky Bros., Inc., 4915 West 67 street, Chicago.*

(Turn to page 94)



PROOF . . . Dramatic contrast between the cleaned and uncleaned portion of the above piston shows how thoroughly carbon is removed by Vapor Blast Liquid Honing — at ONE FIFTH of present costs.

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Liquid Honing* PROCESS

Labor reduced from 5 men to 1 . . . Cost per piston cut from $1.24 to 25¢ . . . That's the record reported by one well-known railroad overhaul shop after switching from hand methods to automatic VAPOR BLAST LIQUID HONING for diesel locomotive piston cleaning!

Today, instead of 5 men with hand scrapers, emery cloth and wire brushes, the job is done by *1 man* — in a specially designed semi-automatic Vapor Blast Liquid Honing machine. Pistons are cleaned more thoroughly, more uniformly, and precision tolerances in ring grooves are easily maintained — at *only 20% of former costs.*

Write . . . for your copy of VB Application "Brief" No. 4 on "Diesel Engine Overhaul"

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Piston-Cleaning Time-Saver

Here's the VB (model D129-49) Semi-Automatic Liquid Honing machine that cuts piston cleaning costs to the bone! Three fixed abrasive guns move up and down automatically over the face of the piston as it rotates. One gun cleans the inside, and another gun is used for "high-spotting" and cleaning the piston crown. Machine is completely self-contained, requiring only air, water, power and exhaust connections. One man does the whole job.

EDITORIALS . . . . . .

Motive Power from the Atom

On January 17, 1955, a nuclear-powered submarine was commissioned by the United States Navy. That gave new impetus to a lot of thinking about future motive power for land, sea and air which has since been sustained by the successful operation of the submarine.

This type of motive power would seem to be particularly suited to naval vessels, surface as well as submarine. It permits them unlimited cruising range without refueling and although their overall operating cost should prove to be somewhat higher than that of oil-fired vessels, it would be unimportant in view of advantages offered.

It seems probable that atomic power for merchant ships, particularly those of large size, may become economically advantageous. Much of the space required by a nuclear reactor is due to the necessary shielding, and for that reason, a reactor of great power need be little larger than one of relatively small output. In any case, fuel tank space becomes available for cargo. Also, since there are no exhaust gases in the ordinary sense, the merchantman might itself become a submarine and avoid the hazards and delays caused by ocean surface conditions.

Next in line in nuclear motive power is the locomotive. Its limiting vertical dimension is about 15 feet and its lateral must not exceed 10 feet. This just barely lets it into the size required for shielding to protect personnel from harmful radiation. But, it apparently is adequate, and those who might insist on absolute shielding, would be asking for something that is not necessary. Full radiation occurs only at full load, and since exposure is a product of radiation and time, exposure of roadside objects would be relatively small at full load because the locomotive would be moving.

Legislation authorizing construction of an atomic-powered locomotive will be introduced by Senator Butler, Republican of Maryland, when the next session of Congress convenes in January. Also, the Atomic Energy Commission has already entered into an agreement with the Baldwin-Lima-Hamilton Corporation and the Denver & Rio Grande Western to conduct studies on the engineering, technical and economic aspects of an atomic locomotive and to make recommendation on the role industry might play in its development. It would appear that one day we may have such a locomotive, but that a lot of water will run under railroad bridges before such a unit will go over them.

Large aircraft for military purposes seem a certainty because of the advantages in range they have to offer. Because of weight limitations, it appears that protection to personnel must consist of two shields, one for the reactor and one for the operators, spaced as far apart as practicable. Landing fields must then be isolated, and servicing equipment very large and costly. The same reasons will eliminate commercial aircraft.

The need for shielding also precludes the possibility of any foreseeable type of highway trucks or automobiles. Tentative designs, including the required shielding, make them appear ridiculous.

The locomotive remains a possibility, but although scientific progress has been accelerated enormously in recent years, it will still take a lot of time to develop so radical an idea into a practical reality. It seems improbable that motorists carrying 1965 licenses will encounter many hazards of collision with atomic locomotives at grade crossings.

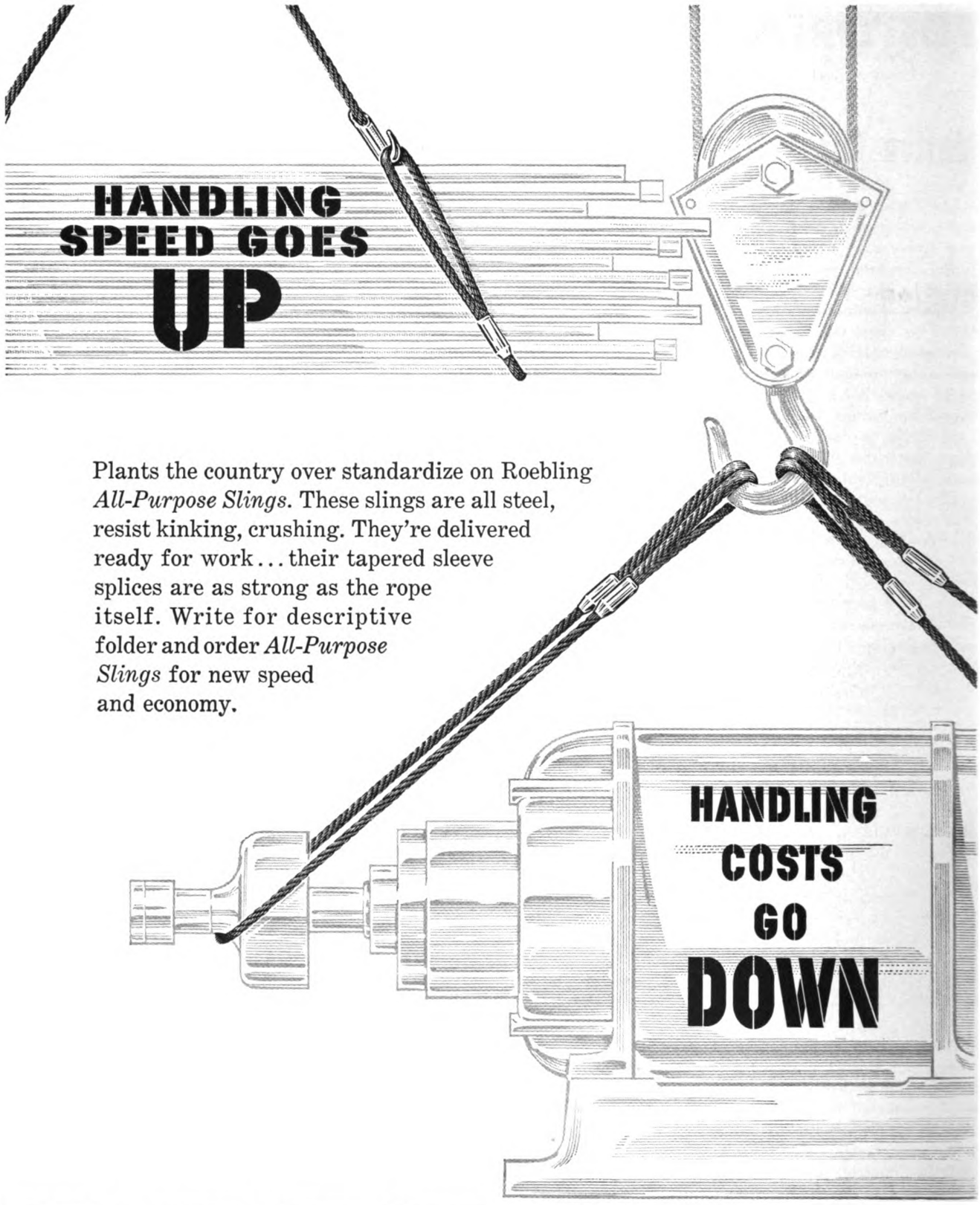
Effective Production Management Needed

Official records show 275,150 maintenance of equipment (and stores) employees on Class 1 railroads last year and their average annual wage $4,127. The work done ranges all the way from oiling journal boxes and helping repair cars to the most skilled effort in every wood and metal-working craft, electricity, electronics, material control, accounting procedure and business machines. Can anyone question the necessity of using the best production management available in all phases of an operation of this magnitude where the labor cost alone exceeds $1 billion a year?

Progressive mechanical and stores department officers have long been aware of the production problem confronting them and constantly sought to install modern machinery, methods and various devices to assure maximum employee cooperation in the results desired. One of the most effective of the latter is the job-methods plan, carried out in some instances by systemwide Production Management Committees on individual railroads.

By this plan, a P.M.C. executive committee is generally set up with members representing system management, shop supervision, materials and evaluation consultants. Local committee meetings are organized and held once a month at all major shop and terminal points, the objective being to develop suggestions which will promote safety, improve working conditions, increase efficiency and maintain closer relations between supervision and maintenance forces.

Local chairmen from different crafts are invited to attend these meetings and all committee members have equal standing under the chairman, regardless of position held on the railroad. A fixed, fast-moving order of



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business is followed, such as: discussion of safety suggestions, 30 min.; conservation of materials, 15 min.; production management suggestions, 60 min.; inspection tour of the terminal, 60 min.; reconvening to discuss conditions and operations observed on the tour. At least three hours or more are required for the program.

Suggestions for improvement are solicited, discussed thoroughly, a few at a time, and acted on promptly insofar as practicable. In general, improvements involving no capital expenditure are put in effect first. Favorable results then give the committees' recommendations added weight.

On one railroad which instituted this plan about four years ago, a total of 310 proposed changes in mechanical department practice have been analyzed and discussed from every angle with the following results: 192 suggestions adopted; 99 rejected; 4 withdrawn; and 15 pending. Will anyone consider it chance that this railroad is making an especially favorable record in reduced locomotive and car repair cost?

Problems Can Disappear Without Being Solved

During a recent discussion there emerged a rather provocative thought on whether many of the problems which disappear are actually solved—or whether we merely learn to live with them.

The question arose during a discussion on the maintenance problems that invariably accompany new equipment. During the first year or so of operation of a new group of diesels or a new series of cars, failure reports on certain items quite often appear at frequent intervals. After approximately a year has gone by, nobody seems to have any further trouble with these items. Their disappearance is generally assumed to mean that the basic faults have been remedied. Is this reasonable?

Not necessarily. Or at least not in all cases. Perhaps some of the problems are met by excessive maintenance or replacement, or by making inspections unduly often. We may be learning to live with many problems instead of solving them.

The distinction can be clarified further by an overly simplified example. Suppose 75 per cent of all light bulbs installed on some passenger car burn out within ten days. Replacing the bulbs every week would be learning to live with the problem. Finding a defect in the manufacture, or adjusting the voltage if that was excessive, would be solutions.

It would seem worthwhile for all of us to prod our thinking every now and then to bring into the open those problems which unfortunately are not so obvious as the example to determine how many cases there are where we are living with a problem instead of solving it.

NEW BOOKS

GRAPHICS IN ENGINEERING AND SCIENCE. By Alexander S. Levens. The principle of this book by Alexander S. Levens is to promote the use of graphics as a language. Employed concurrently with the English language and the language of symbols, as the author points out, graphics becomes a working tool rather than an end in itself.

The new book stresses fundamentals and their applications to the problems that arise in technology. Part I of Levens' work, dealing with orthogonal projection, applies basic concepts to a variety of problems and emphasizes the analysis necessary for their solution. In Part II, "Technical Drawing Practices," the author deals with recognized standards, the importance of technique, and the development of facile freehand drawing as a means towards intelligible expression. Part III is concerned with graphical solutions and computations.

The book demonstrates the effective application of graphic elements to design, research, and development, and invites further coordination with such topics as mathematics, mechanics, and strength of materials. The author presumes a reasonable proficiency in the use of instruments, lettering, and simple geometric constructions, but provides thorough references to this background material in six appendixes.

Accompanying "Graphics in Engineering and Science," are two workbooks, the first coinciding with Part I of the text, and the second relating to Parts II and III. The workbooks, of equal length, contain 74 double leaves, and are priced at $4.00 each.

John Wiley & Sons, Incorporated, 440 Fourth avenue, New York 16. Price $7.00.

DIESEL ENGINEERING HANDBOOK. Ninth Edition. Edited by A. B. Newell. The new Ninth Edition comprises a comprehensive and up-to-date source of the latest information in diesel engine design, maintenance, and operation. It is written as a basic reference guide, for the beginner or expert in all industries using, servicing, or manufacturing diesel engines and accessories. Special emphasis has been placed on fuel and lube oil efficiency and economy. Over 900 separate diesel topics are reviewed. The 30 chapters analyze such diesel subjects as fuel injection systems, cooling systems, fuel oil, pistons and rings, crankshafts and bearings, valves, valve gearing and cylinder heads, supercharging, lubrication, lube oil systems, and engine specifications.

Diesel Publications' Book Division, 192 Lexington avenue, New York 16. Price $8.50 in U.S.

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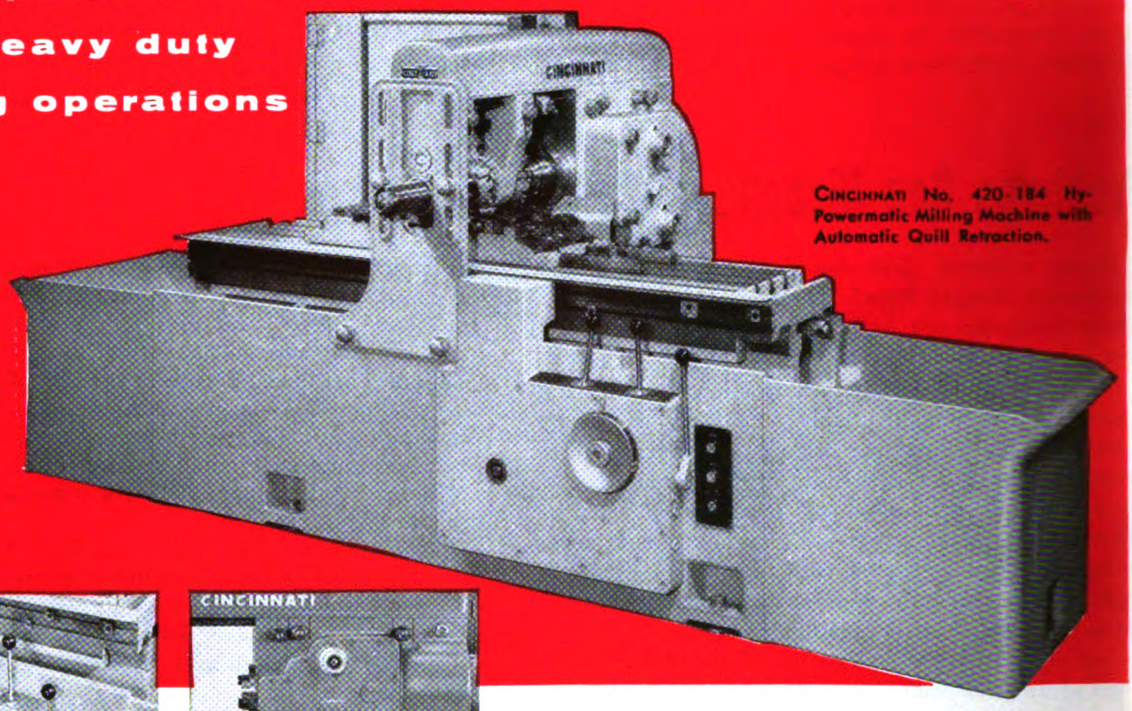
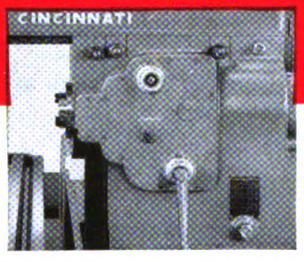
make quick work of your heavy duty milling operations

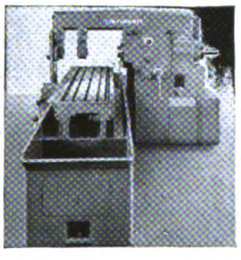


CINCINNATI No. 420-184 HyPowermatic Milling Machine with Automatic Quill Retraction.

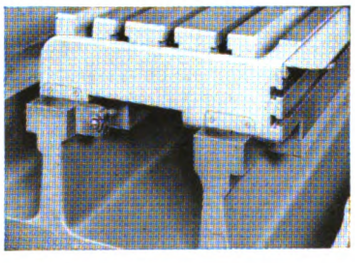
Convenient, compact grouping of operating controls reduces fatigue. HyPowermatic design will make a big hit with your operators.



Save the smooth surface made by face milling cutters, with Automatic Quill Retraction (optional equipment at extra cost).



Chip catcher bed design keeps the floor clean. Chips and cutting fluid stay where they belong, within the bed.



Hardened and ground table ways and square gib construction add their share to HyPowermatic's high cutting capacity.

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1) Infinitely variable table feed rates, ¼" to 150" per minute
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7) Unit type construction, two styles and 42 sizes of each of plain and duplex styles . . . an extra wide selection to fit your requirements

Eleven additional highlights of design and complete specifications for all HyPowermatics will be found in new catalog No. M-1871. Ask for a copy today . . . compare . . . and you'll see why CINCINNATI HyPowermatics can make quick work of your heavy duty milling operations.

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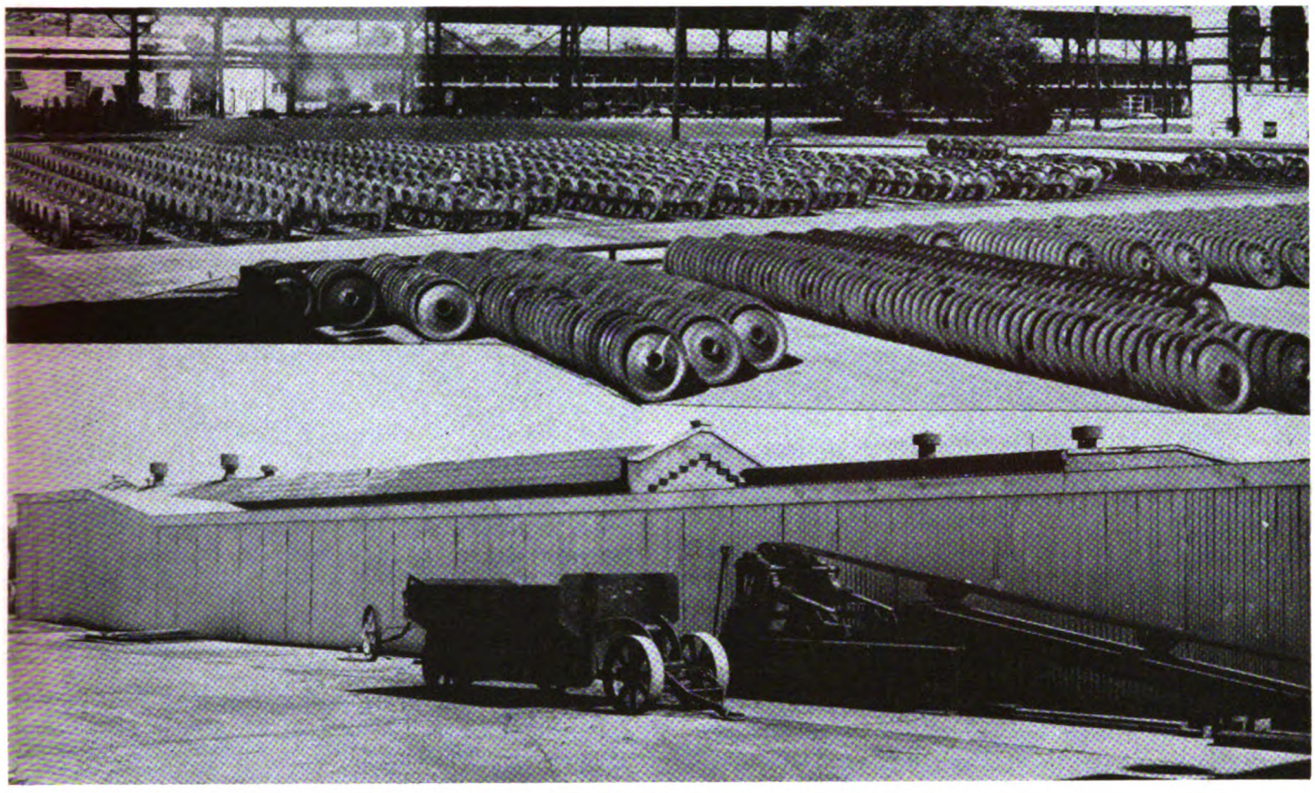


The wheel-storage platform (above) at the north end of the shop where 4,000 loose wheels may be stored. Another space takes care of 2,500 mounted pairs. Below is conveyor shed and chip disposal unit.

Pocatello Wheel Shop Mechanized To the Nth Degree

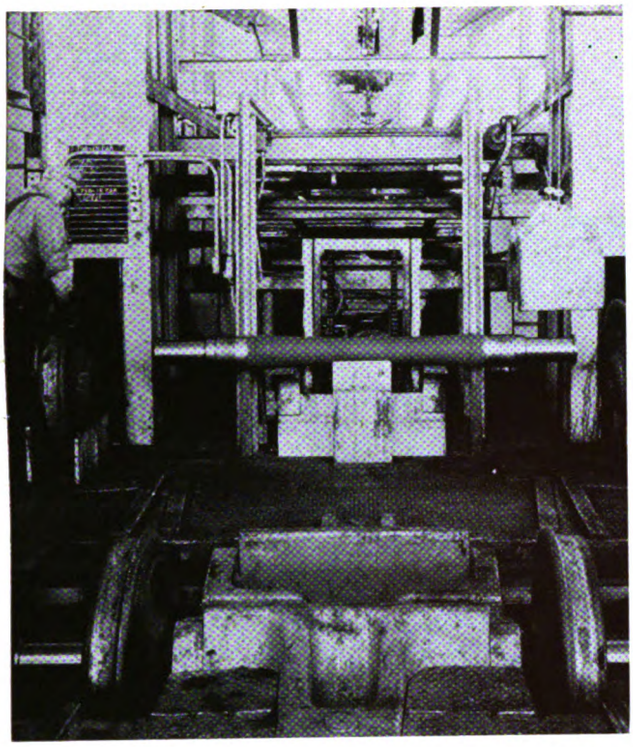
New U P facility in Idaho is featured by modern equipment, automatic operation to minimize manual labor and ingenious shop-made devices to save cost

E. L. Woodward
PACIFIC COAST EDITOR

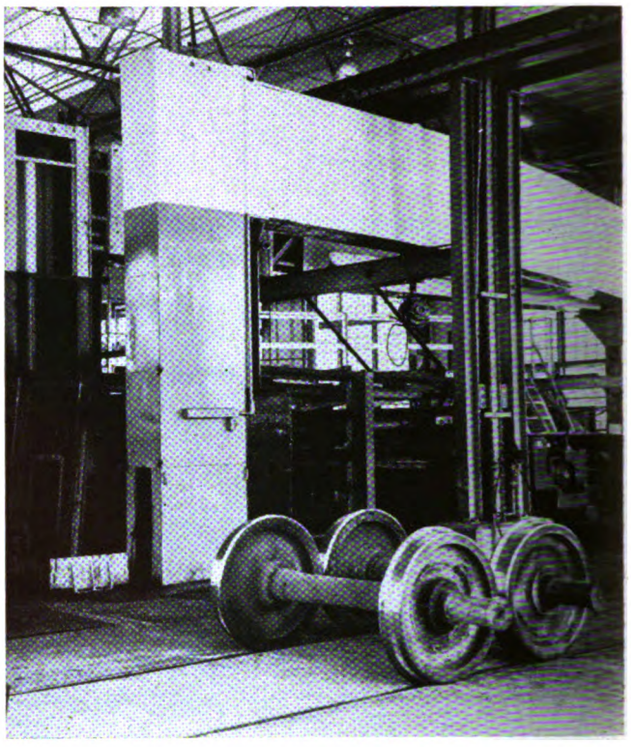
Three things stand out in any inspection of the new Union Pacific car wheel shop at Pocatello, Idaho; namely, its full complement of the latest modern machinery, practical elimination of manual labor in handling wheels and axles, and the extensive use of discarded locomotive and car materials whenever they will serve the desired purpose without buying new.

For example, air-brake cylinders are widely used for turning wheels at rail intersections and many lifting operations in the main shop. Power reverse gear cylinders operate the drop gates which divert wheels from an overhead chute into two scrap wheel cars. An elevating device which raises axles to the four-tier axle rack was produced by using the mechanism from a dismantled fork lift truck.

The chip disposal system utilizes a 140-ft. conveyor belt and drive reclaimed from a steam locomotive coaling station recently torn down. A firebox door-operating valve set in one rail at the outgoing wheel track opens the half door which closes automatically after wheels roll by gravity out of the shop. This operation, highly es-



The Rodgers press for demounting wheels is shown here with the slide for disassembly and elevators.



The wheel elevators are shown here with the gravity chute for delivering wheels to outside scrap cars.

sential in winter, is, of course, unnecessary in warm weather when the half door remains open.

As regards machine equipment, the profile wheel-turning lathe, car wheel borers, axle lathes and gap lathe are the latest design, high-speed, high-production machines, utilizing carbide cutting tools and checked weekly for accuracy and fine adjustment heavy-duty service.

A book could be written about the mechanized operation, automatic devices and push-button controls so extensively used in this modern wheel shop. Not a loose wheel or axle is rolled by hand anywhere, in or out of the shop, except the slight push required to get these parts from conveyor to machine or the reverse and even this is often done mechanically. Wheel up-ending tables, gravity feed conveyors, braking devices and axle racks which tip one way for loading and the other for unloading are commonplace.

A rough count shows 16 four-way air valves, 51 solenoid valves, 37 limit switches and 42 push-button controls used in this shop.

Few, if any, production shops are ever so well equipped that no changes or improvements can be made and this is true of the Pocatello wheel shop. As a matter of fact, the conveyor belt chip-disposal system already mentioned is being replaced with Hack vibration-type equipment which promises to be more reliable in operation and save even the small amount of labor required with the present system. A Paxton-Mitchel wheel washer is also scheduled for installation and thus avoid the necessity of sand or shot-blasting wheels outside the shop, prior to Maganaflux inspection.

Output—200 Pairs a Day

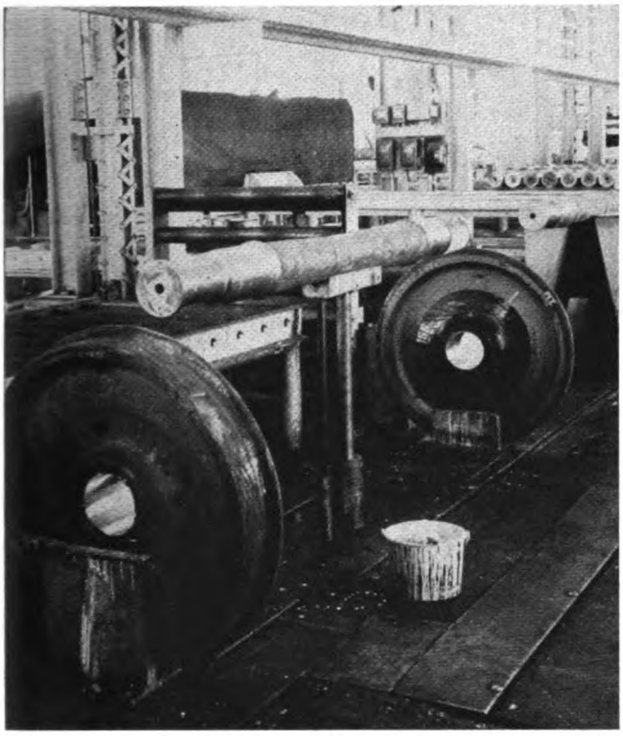
The purpose of the Union Pacific in investigating about $750,000 in the Pocatello wheel shop was to centralize wheel work for the district in an efficient, modern shop, build up the capacity at this point and produce upwards of 200 pairs of 33-in. car wheels a day, including cast iron, cast steel and wrought steel wheels. This production is accomplished with a force of 24 men, including four apprentices on the 8-hr. day shift and 18 men on one 8-hr. night shift. The labor charge for applying new wheels to second-hand axles is expected to be cut from $4.90 to $3.28 a pair in the new shop.

The new Pocatello wheel shop, extending in a general north-south direction, utilizes an old mill building, 80 ft. by 150 ft., which was cleared of all wood-working machinery, the inside walls and roof structure cleaned and painted white. Fifty-seven 400-watt mercury vapor lights were installed to give adequate illumination on dark days as well as for night shift workers. For the same reason, sixteen 1,500-watt flood lights are provided to illuminate wheel storage space and all outside facilities.

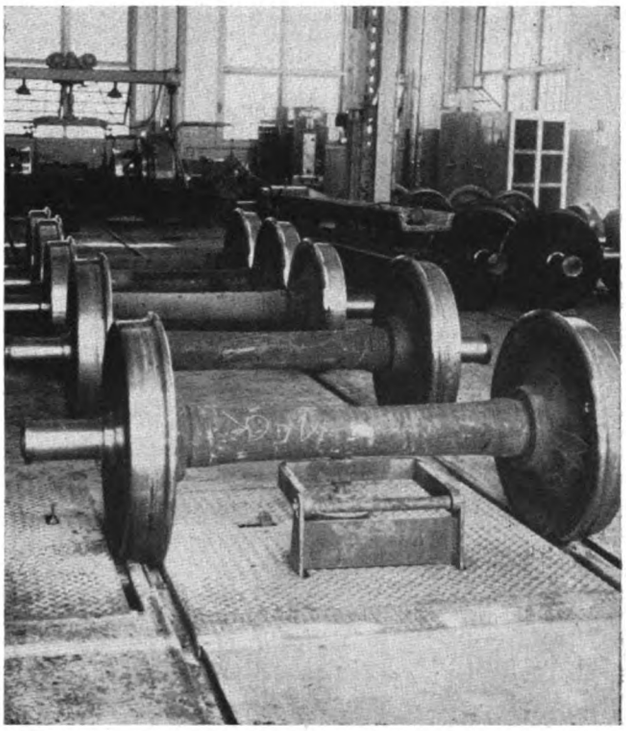
Shop Equipment

Machine tool and other equipment installed in the shop includes: two Manning, Maxwell and Moore 2-ton floor-operated cranes; three Pawling & Harnischfeger 2-ton jib cranes; two Betts car wheel borers; three end-drive axle lathes, one end-drive gap lathe and one profile-turning wheel lathe, supplied by Sellers; one Niles axle-centering lathe; one 36-in. engine lathe; one Rodgers 600-ton wheel dismounting press; one Watson-Stillman 600-ton mounting press; one Magnaglo axle inspection unit; and one Magnaflux unit for mounted steel wheel inspection.

Production with the car wheel boring machines averages 45 to 55 one-wear wrought-steel wheels per machine per 8-hr. shift or 70 cast-iron wheels in the same time. The axle lathes are used to machine 18 to 22 second-hand axles or 14 new ones in 8 hrs. Production with the new wheel lathe is 14-17 pairs of wheels turned in an 8-hr. shift compared to a 7-pair output using conventional



Wheel and axle assembly equipment with axle dolly at right ready with the next axle.



Rollers in track facilitate Magnaflux inspection. Floor bracket is contact to start wheels rolling out of shop.

wheel lathe and tooling. These wheels vary from 33-in. car wheels to 40-in. diesel wheels. The gap lathe refinishes journals on 18 to 24 pairs of wheels per shift. The dismounting press operated by two men can press off 120 pairs of wheels per shift and the mounting press mounts whatever wheels are bored.

Wheel storage space at the north end of the shop extends 180 ft. to a depressed pit where wheel cars are run in and loaded or unloaded. This platform is made of concrete poured on steel grating for permanence under heavy lift-truck operation. The platform has a capacity to store 4,000 loose wheels. Similarly, large storage space for 2,500 pairs of mounted wheels is provided on stub tracks just west of the shop.

Work Flow

All mounted steel wheels which require turning come in through the south end of the shop and, if journal turning only is required, the wheels are either revolved at the first turntable to a short track for storage or go directly to the second turntable for processing through the gap lathe.

In case both wheel and journal turning are required, the wheels are rolled to the second turntable from which they move to the profile wheel lathe, then back to the gap lathe for journal turning and into position for Magnaflux inspection.

A unique feature of this position is that the wheels rest on two pairs of small air-operated rollers set in the track and foot-treadle controlled by the Magnaflux operator. The wheels are thus automatically revolved during magnaflux inspection and when this is completed the operator simply steps on another lever in the floor, causing a small air-cylinder operated bracket to swing up, contact the journal and give a push which starts the wheels rolling out of the shop.

Most of the wheel work at this shop; in fact, about 75 per cent, consists of the application of new wheels to second-hand axles. Mounted bad-order car wheels are rolled into the shop to the Rodgers dismounting press where they are automatically lowered into the press, wheels pressed off to the journals, elevated to the shop floor and rolled to the disassembly slide which moves the wheels sideways off the axle. This leaves them free to roll quickly into the wheel elevators which raise them to the overhead wheel chutes.

These two chutes converge into one and an ingenious trip-operated stop holds the left wheel back until the right wheel gets into the single chute and rolls out of the shop into one of the two scrap wheel cars.

Coming back to the axle which is supported on the fork lift, previously mentioned, simple pushing of a button causes this axle to move upward and roll into the top of a four-tier, continuous, 40-axle capacity rack which automatically delivers its product on the bottom tier to the axle-centering machine. The operator of this machine quickly trues the centers and an automatic unloading device places the axle on a 4-wheel dolly on a conveyor and moves it under push-button control to any of the three loading racks leading to the axle lathes.

After machining, axles are dropped smoothly to one of the three underneath racks and roll to the unloading conveyor. The Magnaglo test operator has control of the dolly on this conveyor and can send it at will to any one of the three axle lathe unloading racks where it automatically picks up the axle first out and brings it to a position opposite the Magnaglo machine which also is mechanically loaded and unloaded. On completion of a quick but careful Magnaglo inspection, the operator moves the axle on the third dolly and axle conveyor to any one of four finished-axle-storage racks.

The large axle dolly which operates on narrow-gage

Outside the shop immediately adjacent to the demounting press. The serviceable demounted wheels are shown at the left as they have come out through the shop wall opening. At right is a completely mounted pair of steel wheels.

track in the floor and brings axles to the assembly position under push-button control by the wheel mounting press operator, cuts through all four finished axle-storage racks. This necessitates bridging the gaps which is done with short bar rails mechanically raised and lowered as required. Storage rack extensions are built with pivoted top rails which incline slightly towards the shop wall to permit gravity loading. Gravity unloading back to the axle dolly, as needed, is also made feasible by powerful, air-operated eccentrics which elevate the outer ends of the alternate racks about four inches.

Wheel Movement

New car wheels are taken four at a time by a fork-lift truck from the loose wheel storage platform to the outer end of a 130-ft steam-heated, wheel-conveyor shed which is kept at shop temperature the year around. An air-operated upending device places the wheels, one at a time, horizontally on a ball-bearing roller conveyor which moves them by gravity into the shop to either one of two car-wheel boring machines. Each machine operator micrometer calipers his own axles and bores wheels with the proper allowance for a press fit, marking individual wheels to make sure they are applied to the axle ends for which they are fitted.

Finish-bored wheels also move by gravity down two roller conveyors to the assembly position where they are upended on two roller tables and rolled into a wheel assembly slide which moves them sideways over the protected journal ends of an axle already brought to position by a dolly. The press, manned by two men, is of the roll-through type and arranged for just as little expenditure of time and manual labor as possible in pressing on wheels. A record of mounting pressures is kept and held well within AAR limits.

After being pressed on and inspected, the wheel and axle assembly, with journals coated with a rust preventative roll by gravity out of the shop through an automatic opening half door, as mentioned, to the delivery track. Any axles which are worn to the limit or otherwise defective are loaded on one of the racks and roll by gravity out of the shop.

In case either wheel of a pair just received in the shop and dismounted in the press proves to have additional good service life, it is placed on a wheel chute and rolls by gravity out of the shop for storage until subsequent use.

The chip disposal conveyor extends from the wheel lathe past the three axle lathes, two boring mills and out the shop. The weakness of this system is inability of the conveyor belt to stand up under hot chips. With the new agitator system, supplied by the Hack Engineering Company, Denver, Colo., chips will be delivered into an open outside pit and loaded by magnet crane directly into a scrap car.

The three axle conveyors and dollies were supplied by the Mathews Conveyor Company, San Carlos, Calif.; the solenoid valves by the Square-D Company, Milwaukee, Wis.; wheel upenders and four-way air valves by the Hanna Engineering Works, Chicago. The upender equipment for tipping wheels from a horizontal to a vertical position includes two cylinders, one of which operates a wheel stop and the other does the actual tipping. In addition, a third cylinder operates a brake to retard the wheel delivery speed.

A catwalk, constructed of steel with 24-in. wide grid walkway and safety hand rails, extends down the center of the shop about 8 ft above floor level for the benefit of visitors and interested civic groups who can thus go through the shop and watch operations in safety and without interfering with the work.

Chicago Mechanical Meetings Considered Many Topics

On this and the following pages are several technical reports that were presented during the annual meetings of the Coordinated Mechanical Associations at Chicago in September. While some of these reports were published in summary form in the *Mechanical Dailies* during the meetings, it is felt that they are of sufficient interest to include them here in greater detail. Lack of space prevented their use in our November issue. Among them are a Fuel Association report on winter operation of diesel-electric locomotives, CDOA reports on loading rules and car painting, and LMOA reports on running gear maintenance and problems of supervision.

Railway Fuel and Traveling Engineers Assn.

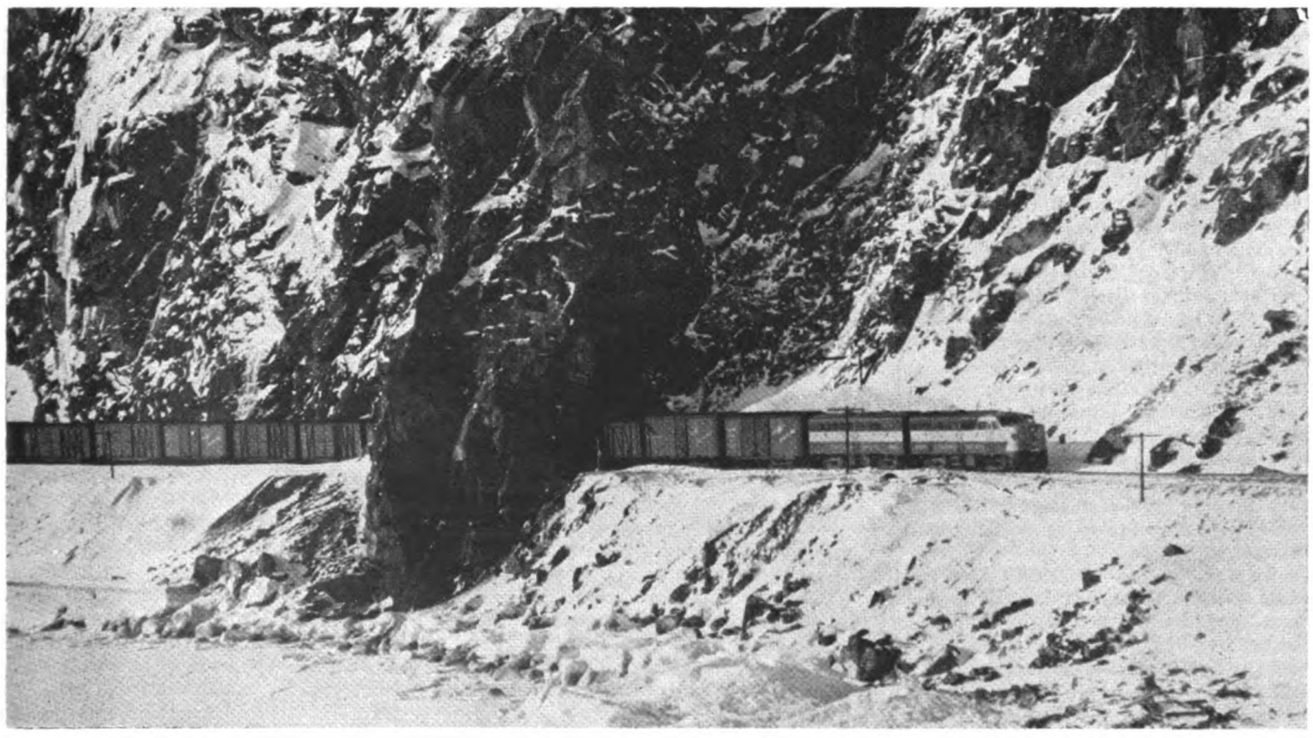
Cold-Weather Diesel Locomotive Operating Problems

E. E. Erickson
Road Foreman of Diesels
CANADIAN NATIONAL

The first of our present diesels were operated in the winter of 1949 and 1950, General Motors placed a three unit passenger locomotive and the American Locomotive Company, a two unit passenger locomotive on the Montreal to Winnipeg run. These units were operated in both passenger and freight service. On these test runs, the individual builders had their own service and maintenance men to keep the units operating.

Starting Cold Engines

When a unit is recieved dead in zero weather at a point where it is going to be put in service, it is well to check the unit to see what it requires in the line of fuel and oil, and also make ready everything possible before putting the unit in the shop to be started. Water should be put in the cooling system and the builder's prescribed method of starting the engine followed as soon as possible after the unit is in the shop. After the engine has been started and checked, the unit should be placed out on a track where it can be moved to and fro on its own power.



The application of power to the traction motors and the output of power from the main generator has a heating effect which has a tendency to thaw and evaporate the moisture contained on the metal in the form of frost. The movement of air caused by the rotating parts and by the traction-motor blowers has a drying effect. The unit should be kept moving for approximately three hours or more,—during the latter part of which the independent brake should be applied lightly so as to increase this drying effect with the application of more power.

If the unit were to be placed in a warm shop long enough to permit the frost to appear in moisture form on the generators and traction motors, you would not be able to move the unit until the frost had all worked out and the parts had been blown out with clean dry air. This would take anywhere from twenty-four to thirty-six hours. If not removed, the moisture would cause a flash-over on either the generators or motors.

Frozen Fuel Lines

In the first winter's operation, the suction filters on most of the units were being removed by crew members because of wax formation and icing up caused by the pour point of the fuel oil, and by condensation from the fuel tank freezing at this point. At one stage we had trouble when the fuel line between the fuel sump and the fuel supply pump froze up cutting off the fuel supply to the engine. A water heater installed in the fuel line ahead of the suction filter was the remedy. This heater is a jacket type with the fuel-oil coils surrounded with the hot water taken from the engine cooling supply. Other railways have fuel tanks satisfactorily insulated with 2-in. glass wool.

Maintaining Water Temperatures

To maintain the proper engine water operating temperature, in most cases it is only logical to make the automatic controls take over and to try to keep the cooling water from getting too cool. On yard switching units, water temperatures can be kept up by partially blanketing off the shutters and placing a canvas sheet over the cooling fan exhaust opening on top of the hood, and tying it down along both sides. When the water temperature reaches a point to cut in the cooling fan, the sheet on top of the hood inflates and rises—allowing the warm air to escape. When the fan cuts out, the sheet covers the opening and helps hold the heat in.

On some units standby heaters are employed to keep the engine temperature up. One type of standby heater is oil-fired and automatically controlled. It cuts in when the water temperature drops to 130 deg F and shuts off at 150 deg F. The engine cooling water is circulated by a pump and the unit may be shut down when the heater is connected to an outside source of power.

Another type is electrical. There are four 250-watt immersion heaters on each unit connected to a tank through which engine cooling water circulates. These heaters draw their electric power from the main generator and the diesel engine is never shut off.

Without some sort of assistance, these small engines in 40 or 50 deg below zero weather will not stay warm while idling. The road freight and passenger units give very little trouble in this respect.

Summer-winter switch is also included in the engine temperature control circuit on most units. When in the winter position the opening up of the shutters is forestalled and the cooling fans cut in first.

Snow in the Air Supply

Because engine blowers and traction motor cooling fans draw the air from the engine room, it was found that this caused snow to drift into the engine room through body filters and cover the engine room generators, and entering electrical cabinets. There were a few failures attributed to this condition causing ground. To overcome this the body filters were blocked off, with the exception of a few at the rear of the units. Warm air was admitted into the engine room through a winterization duct built around the No. 4 cooling fan. On some units the air is taken in through the radiators and enters the engine room through a hatch grille.

Weather stripping around the engine room doors must be in good condition and the doors themselves must be a good fit. Caulking compound placed around all cable and other openings in the floor of the electrical cabinets is a must to keep out the snow.

Cab Heating

The cabs of most diesel units are heated with hot water from the engine cooling water. Some have heaters of a recirculating type piped off the cooling system with no connection to outside air. Others have air ducts leading from a portion of the engine cooling radiator that has been blocked off and the air is drawn through the radiator and duct into the cab by two fans operated with separate controls. The recirculating type of heaters at times have been found to be inadequate. The air requirements of the engine and traction-motor blowers cause a slight vacuum in the engine room which in turn robs air from the cab at higher engine speeds and makes the cabs cold and drafty. The application of the winterization duct to the engine room on some units helps to eliminate this condition. Our yard engines have been equipped with a storm sash built to take in the side wind-shields, similar to a bay window. This eliminates the opening of the engineer's window and stops the draft. Weather stripping around cab doors and windows must be tight.

Steam Heat

Steam generators on passenger units give very little trouble. The air intake duct to the blower on the roof, tends to frost up, cutting off the air supply to the burner. When this occurs, a covered vent in the air inlet pipe, when opened, allows air to be drawn into the burner from the engine room. The water supply pipes which run almost the length of the unit are protected from freezing with steam tracer piping choked to prevent over-heating of the water. On other units an electric cable, wrapped around the piping is being used.

The Compressed Air System

Radiation piping between the air compressor and the No. 1 reservoir mounted on the roof of one class of diesel power was found to be freezing, causing the compressor relief valve to open. This apparently was due to insufficient drop to allow proper drainage in the pipes. Drawings are being corrected to rectify this condition.

In extreme cold weather, long freight trains have to be reduced as the required brake-pipe pressure cannot be maintained at the rear because of the frozen hose couplings allowing slight leakage. The control air is taken off the main reservoir and magnet valves of the shunt contactors freeze, preventing transition from taking place and resulting in loss of power at higher speeds. This was caused by the control air reservoir not being blown out.

On units that are being shipped dead give the batteries a little consideration. The temperature at which they freeze depends upon the hydrometer readings. A fully charged battery is good for —62 deg, while a half charged battery starts to freeze at about —16 deg.

Still Too Many Deaths and Injuries

J. H. Williams
Superintendent of Safety
TEXAS & PACIFIC

"Many people say that the subject of safety is dry, but let's not forget that every accident always leaves a pool of wet blood," said Mr. Williams introducing his address on safety. "While it is true at this time entirely too many accidents are occurring on American railroads that result in death and injury to employees and untold hardship and suffering to their families, the picture is much brighter than it was a few decades ago."

On the T&P in 1947, he said, there were 602 reportable injuries; in 1954 there were only 144 injuries. Here are some of the things which were done to bring about this result:

1. A study of the type of men who were being hired. Hiring must be done by a responsible officer or supervisor. He must be sure the applicant is physically, mentally, morally and spiritually right. He must know that the applicant can adjust

himself to the work he will be expected to perform and that he can get along with other people.

2. The applicant must be properly trained. The attitude of the supervisor is most important when it comes to teaching the young employee.

3. A good supervisor must develop a two-way communicating system. He must be able to give clear, simple instructions and he must be a good listener. If he does not listen when men speak up to make suggestions or ask questions, the employee will feel that it is a waste of time to speak up.

Six requirements of a supervisor, for the development of human relations are:

(1) Compliment his men for work well done,

(2) Give credit for suggestions,

(3) Avoid playing favorites,

(4) Try to make each man feel that his contribution or participation is important,

(5) Take time to make the new man feel he belongs to the team and introduce him carefully to the fundamentals of safety, and

(6) Repeatedly go over and explain safety rules and practices.

Pictures—Not Speeches

"Getting on with our program on the T&P," said Mr. Williams, "in addition to correcting every hazard that we could find and also providing better tools and places for our employees to work, we went about an educational program that took a special conference car over our entire railroad. First, we took in foremen and supervisors, and by use of educational moving pictures and qualified conference leaders in the field of safety we were able to stir up a considerable amount of interest among the supervisors and foremen from one end of the railroad to the other. After this was finished, we then started out to hold safety rallies at all of our larger shop and terminal points, and in addition we kept our safety conference car, which is completely air conditioned, moving up and down the railroad with our visual education safety films. We brought about every type of safety moving picture that was offered, and I must say that the men prefer movies pertinent to their work over a lot of long speeches."

To create competition, two large gold plated trophies were purchased. These are known as the W. G. Vollmer Safety Trophies, named after the president of the railroad. One of these goes to the winning division and the other to the winning shop each year, the awards being personally presented by President Vollmer at a huge banquet to which are invited all employees and their wives of whatever division or shop happens to have the lowest safety ratio. "This arrangement," he said, "has stimulated safety very much on our railroad, and I might add that none of our big shops coming under the trophy arrangement has suffered a reportable injury thus far this year."

Ladies Safety Council

In a large number of cases it was found that injuries were being brought about by the employee bringing too many worries on the job from home. A test was made by encouraging the organization of a group of wives of employees at one large operating terminal into a club known as the T&P Ladies Safety Council. They were to promote safety among their families and the families of all railroad people at this location, in the home, schools and community. Starting with 40 members, this group now has a membership of about 250. T&P women up and down the road have made requests for similar type clubs, and there are now about 15 of these clubs with a total membership of 2,600. They have been many times honored; editorials have been written about them, and state officials from the governors down have commended them.

Mr. Williams said that it is not always the new employee who acts foolishly, like jumping from the top of a car on one track to the top of a car on another track. Many times it is an experienced employee who should know better. "There are times" he said, "when we feel that we can do almost anything, that we can perform miracles, but lots of times we are not nearly as good as we think we are."

Mr. Williams closed by citing the danger of shock where small amounts of current are involved. With 1 to 8 milliamperes there is a sensation of shock, but it is not painful; 8 to 15 milliamperes produces painful shock but muscular control is not lost; 15 to 20 milliamperes causes loss of muscular control, 20 to 50 milliamperes causes severe muscular contractions; heart failure is possible with 50 to 100 milliamperes; with 100 to 200 milliamperes heart failure is probably; over 200 milliamperes will cause severe pain and heart failure.

Car Department Officers Assn.

Loading Rule Changes Proposed

AAR Loading Rule requirements as explained and outlined in the MD Pamphlets 1 through 7 are quite adequate for the safe handling of open-top-car commodities. Rather than extensive revisions or additions to the present rules, the greater need is for the rail carriers to amplify contracts with shippers by qualified car department personnel to assist, advise and educate shippers in the proper method of loading open-top cars.

In most cases shippers are eager to cooperate to get their merchandise to destination in good condition without delay. Such assistance in turn benefits the railroad by reducing damage claims and minimizing the need for switching bad order loads to the repair track for adjustment.

Operating departments should step up their campaign for better handling of open-top loads in train yards and terminals, for regardless of what measures are taken toward developing and enforcing the loading rules, they will not be fully productive without continued efforts by the operating departments to improve train and car handling operations.

Ten Proposed Changes

The following items were submitted for approval and consideration by the AAR Loading Rules Committee:

1. Provide more bulkhead flat cars to meet the increasing tendency of shippers to handle lumber, plywood, wallboard and similar merchandise on flat cars with fork lift trucks. Bulkheaded cars assigned to lumber loading and the like would do much to win back to the rails a large amount of this high class revenue.

2. As piggy backing truck load freight will eventually involve interchanging piggy back flats, standard tie down devices and equipment should be adopted and a figure formulated to cover the securement of trailers to flat cars.

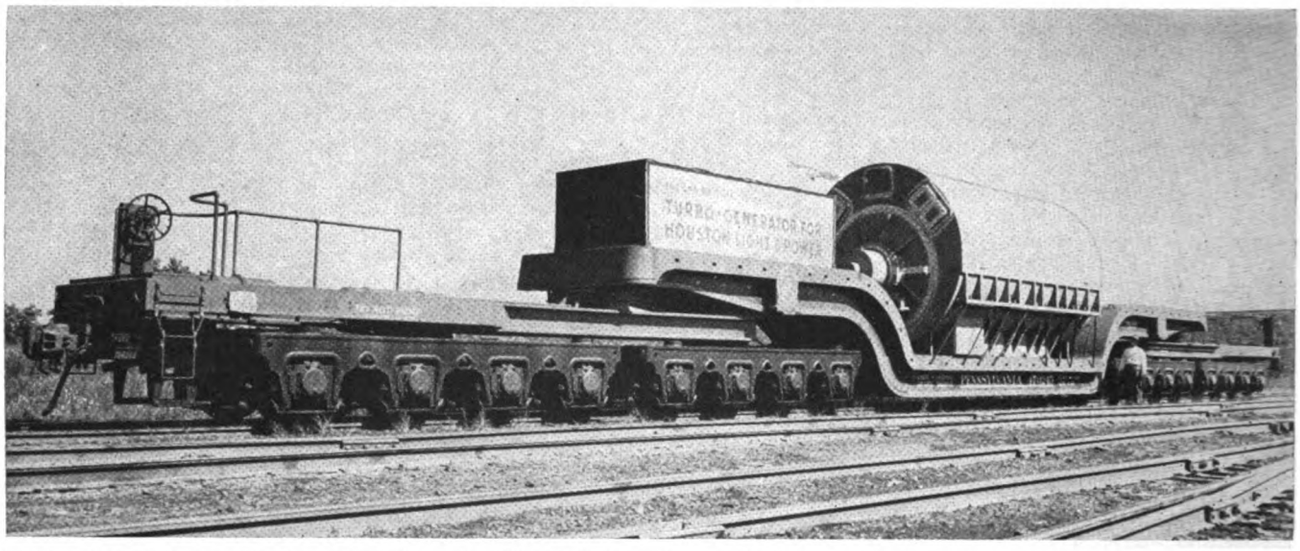
3. AAR Interchange Rule 4, Item 3, Paragraph (f) (which calls for a defect card on holes exceeding 2 in. measured in any direction) should be revised to coincide with Item (e) of AAR General Rule 15 on loading open top cars, which allows slots ½ in. by 2½ in. to be cut for application of bands and wires. This is to acknowledge the need to cut slots in car bodies for application of the considerable amount of 2-in. steel banding now used to secure lading on cars, and the impossibility of cutting slots of exactly 2 in. with an acetylene torch.

4. Adopt a uniform excessive dimension card for open top loads, and make its application mandatory by the originating carrier on open top loads having height and width dimensions in excess of published clearances. This card should be incorporated in General Rule 19 as there is just as great a need for a card of this kind as there is for the rotating machine card provided for in that rule.

5. Further study and consideration should be given to changing the various MD Pamphlets to loose leaf form. While the orginal cost of making this change would be rather high it would be economical in the long run as it would practically eliminate the need for the complete re-issuance of these pamphlets.

6. Make a study to improve the loading of coils of flat steel according to Sketches 1, 2 and 3 of Fig. 35 of Pamphlet MD-1. Extending Items B and C the full length of the car in Sketches 1, 2 and 3, and securing the coils with an additional Item F will eliminate the difficulties now being encountered with loads of coiled flat steel less than 55 in. in diameter in gondola which shift past Item B and roll toward the side of the car, causing the load to become badly disarranged.

7. Revise Fig. 14 in Pamphlet MD-3 (covering the loading of peeled pulpwood crosswise in gondola cars) to show Item D encircling Item C the full width of the car to eliminate the many instances where Item C becomes disarranged and fans out,



Loading rules include regulation of oversize lading such as this 426,500-lb turbo-generator being handled on the 250-ton all-welded flat car built by the Pennsylvania at Altoona shops.

causing excessive width or impaired clearance, due to the corner end stakes of Item C creeping around the side of the load.

8. The committee has learned that the securement of truck tanks on flat cars per Fig. 57, Pamphlet MD-5, is being objected to by shippers on certain types of truck tanks as the paint is damaged by contact with the tie bands, Item G. Tank shells on these truck tanks are also being dented by these tie bands. The committee therefore recommended that an alternate method of securement be developed and approved, which will not require the use of tie down bands over the tank shell, and will submit to the AAR Loading Rules Committee a print of the proposed alternate method eliminating the use of tie down bands.

9. A change in Item G of Fig. 23 and Item F of Fig. 24, Pamphlet MD-7, which items are anti-skid plates, Pattern 64, located between stacking lugs on the bottom layer of skid units of empty jet trailers and the skids of the units of the top layer. Pattern 64 specifies that skid plates must have metal tab extrusions on the bottom of the plate bent to an angle of 60 deg. The committee felt that since the anti-skid tabs are contacting a metal surface when jet containers are loaded according to Figs. 23 and 24, the anti-skid feature is nullified. Therefore, it would be better to have the ends of the anti-skid plate bent downward to secure it in position on the stacking lug, and thereby prevent longitudinal movement.

10. An alternate method should be provided for Item F in Figs. 70 and 71, and Item G in Fig. 72, Pamphlet MD-7, which items specify that vehicle axles or springs or spring shackles are to be secured to the floor of car with 1 in. No. 14 BW gage hot rolled steel, or four strands of No. 8 gage annealed wire. The alternate would permit securing the wheel and axle assembly of a vehicle to a flat car with four strands of No. 8 gage annealed wire twisted taut from the wheels or wheel spokes to the stake pocket. Reason: Securement from wheels to stake pocket should prove to be more dependable, and provide a simpler and easier method of securing the wheel and axle assembly to the car.

Chairman of the committee which prepared this report was J. M. Hick, general car foreman of the Great Northern.

How To Prepare and Paint Different Surfaces

Most paint failures can be attributed to the following faults of preparation:

- Not sandblasting new steel and therefore priming over mill scale.
- Not properly cleaning metal after paint stripper has been used.
- Cleaning surfaces with dirty or reclaimed solvents.
- Improper primer or surfacer used.
- Excessive amounts of primer or surfacer being applied.
- Recoating over putty or glaze compounds before thoroughly air dried.
- Not allowing sufficient drying time for primer-surfacer coats before applying finish coats.
- Priming over damp surfaces.

The committee made the following recommendations for surface preparation:

Stainless Steel—While stainless steel should not be painted, it should be sandblasted before finishing when painting is demanded. Where sandblasting equipment is not available, a thorough sanding is necessary to roughen the surface. The use of ordinary acid or alkali etching solutions has little effect on stainless steel. After metal receives either of the above treatments, it is ready for an approved primer and finish coats.

Steel—Sandblast or shotblast any steel containing mill scale before painting.

Aluminum—Treat with a phosphoric acid-type metal cleaner. Following the phosphoric acid cleaner treatment, the surfaces must be thoroughly rinsed with clean water to remove all traces of free acid or other residue, and then a dehydrating conditioner applied. After one of the above treatments, all surfaces must be completely dry before priming. Light sandblasting of heavier sections of aluminum to roughen its surface has also proven satisfactory.

Zinc-Coated Metals—After phosphatizing treatment, apply an approved primer and finish coats.

Don't Wash Too Soon

Although diesels and cars receive the proper paint treatment, the condition exists on some railroads where a diesel locomotive is put in service from two to four hours after it has been painted. In many cases it goes through a car washing machine in eight to ten hours after it has been painted. The surface paint is hardly dry, let alone the undercoats. This practice dulls the lustre of the paint and causes the finish to look like an aged paint job.

Coaches often pass through a car washing machine before top surface coats are dry, resulting in a dull finish and an old appearing paint job, far too soon after its short time in service.

The finish coats should be allowed to dry 30 days prior to washing the cars in a washing machine.

This report was prepared by a committee of which R. C. Fisher, foreman painter, NYC, was chairman.

Diesel Locomotive Axles, Wheels and Trucks

There are considerable differences of opinion regarding scheduled truck overhaul. It should be done when necessary and could be programmed to coincide with truck and wheel changes, provided, of course, that spare trucks are on hand for replacements. If the latter does not exist, then progressive maintenance should prevail, until a unit is held for general repairs or 2, 4, 6 or 8-year inspections.

The life of wheels varies between mountain railroads and river grade railroads, also railroads with many curves and roads with many miles of straight track. Mileage, on passenger diesel wheels, varies from 100,000 to 300,000 between wheel changes. Mileage on freight diesel locomotives from 250,000 to 325,000. On road switcher and switchers it varies. Many roads are adopting wheel truing and grinding machines, that eliminate the necessity of removing the wheel or truck for wheel truing.

Some good practices are as follows: When a truck is *removed* for any cause, give attention to brake rigging, hangers, pins and bushings, spring rigging, bolster hangers and pins. When truck are *overhauled*, give attention to bolsters, which require little attention other than to clean them and inspect for cracks and defects. Bolster wear in the truck frame should be kept to a minimum, or as per manufacturer's recommendation, the wear plates should be inspected and, if worn, should be replaced.

Keep center plate well lubricated, having the proper liners, necessary clearances to prevent excessive flange loading and wear, due to restrictive center bearing action, also proper side bearing clearance should be maintained. Each time equalizer is removed, the rebuilding of the worn surface on boxes is recommended; also where wear pads are used and boxes damaged, due to broken pads, a saving is realized when inspection reveals that the wear plate on boxes found loose and repairs are made at once.

Worn equalizers should be reclaimed by the welding process and normalized to relieve stresses.

Pedestal jaw liners will wear due to coming in contact with the box and wear should be kept to a minimum, reducing the separation between the pinion and ring gear; also the pounding action of the journal box in the pedestal jaws. Pedestal jaw liners can be reclaimed by the spray metal process and save more than 50 per cent of the cost of the liner. It is not recommended to lubricate pedestal jaw liners, as lubrication accumulates road dust and grime and becomes an abrasive and at this point, wear is excessive. However, one road has reported that it has found that dry graphite serves weel as a lubricant Particular attention should be given to pedestal leg bolt holes, to be certain that these holes maintain proper shoe bolt fit to prevent excessive wear on the pedestal shoe liner. Also, attention should be given to the spring hanger eye. All portions of frame that can be handled by Magnafluxing should be given thorough inspection and necessary repairs to defects found.

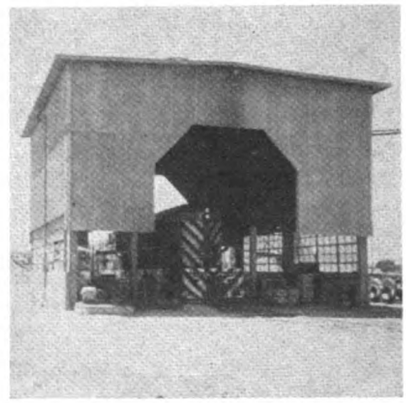
General improvement can be obtained, relative to flange wear through reduction of back to back dimensions of wheels mounted on axle, to prevent unnecessary flange contact with ball of rail. One item causing considerable reduction of wheel life on passenger units is the 36-in. wheel. This condition exists mainly due to surface stress on 36-in. wheels in this service, and one railroad (Lackawanna) is testing 38-in. wheels. It is possible this one road can furnish additional information as to the advantages seen at the present time.

Wear of wheels can be minimized by having wheels properly aligned and equipment in proper mechanical condition.

Every effort should be made to avoid the abnormal loss of tread metal, caused by thermal cracking and shelling. Wheel life depends largely on the resistance of the wheel to wear and its immunity to tread failures, caused by thermal cracking and shelling.

Grease Leaking from Axle Gear Housings

Many roads have adopted the Electro-Motive change to the improved type gear case using Jet Lube. One road feels that this is not the most desirable change, either from a maintenance or an economic standpoint, as more money is spent making the change required properly to retain Jet Lube. Oil companies were requested to furnish this railroad a conventional type grease, having EP characteristics and slumping qualities, which would permit proper lubrication and better retention of the grease in gear cases, even of the older type. At present, Standard of New Jersey sey is the only company having furnished such a lubricant. The test has been in progress for six months with little difference in wear of pinion and ring gear teeth noted through comparison of similar condition under test with Crater Compound. The lubricant being tested has not yet been identified to the railroad, but is being retained practically 100 per cent with no appreciable loss and with only one period of lubrication adding in the six-month service test period. This test will be continued and the result of one year's operation will be considered sufficient to determine the advisability of adopting the material as standard.



Protective shed installed over standard wheel-truing machine at Barstow, Cal., diesel shop of the Santa Fe.

Other railroads feel that if gear cases are properly cleaned and repaired, with felts renewed each time wheels are applied, the grease leakage can be kept to a minimum.

Sand pipes are important. The greatest improvement to them can be made through maintenance of the pipes, as originally delivered, with a minimum of sand delivered from each trap and proper alignment of sand pipes.

Improvement can be made by the application of a rubber sand pipe extension, which directs the sand to the actual point of contact, between wheels and rail.

Recommended amounts are as follows: Units with cabs—1¼ to 1½ lb per minute; B units or passenger, 1 to 1¼ lb per minute. This amount of sand is adequate, provided it is directed to the proper contact point.

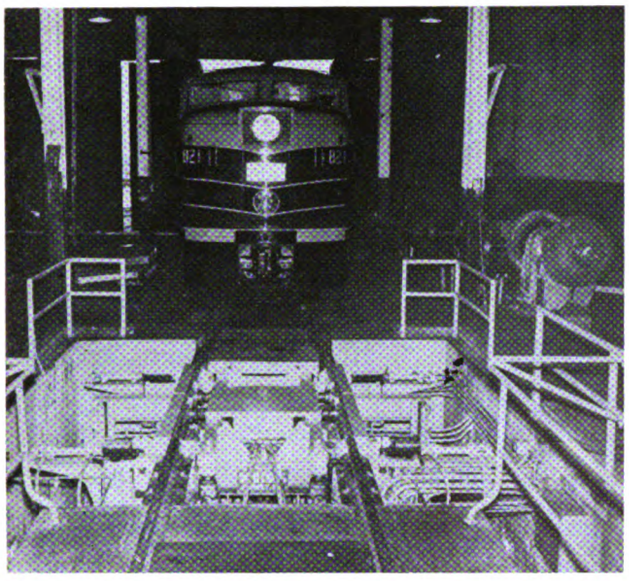
Some railroads are changing the sand pipe application from the brake head to frame.

The proper direction and control of sand, as well as volume used, is as important to the diesel engine, as it is from a traction standpoint. Necessary attention given this matter can result in reduction of wear rate in the main diesel engine. One railroad uses a front wheel sander, which operates from an independent sand valve, using the two front sand traps as originally applied to the locomotive. This front wheel sander does not, in any way, annul the master sander operation or automatic sanding operation. Considerable reduction in the amount of sand used is noted, where engine crews become familiar with the use of front wheel sander and use same for minor sand application to rail at road crossings and for continuous sanding of bad rail condition, where it is found front wheel sander is sufficient to give proper traction.

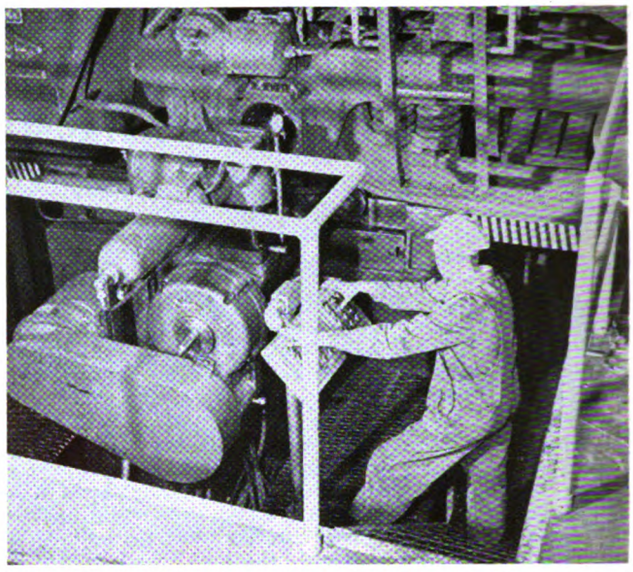
Maintaining Wheel Contour

The value of various methods of maintaining wheel contour depends entirely on the conditions under which the locomotives are operated and maintained. At outlying stations, where a minimum of maintenance is performed, it is advisable to use Ledgerwood tools to reduce high flanges and restore flange contour.

Abrasive type brake shoes are also satisfactory for use on switching locomotives in large terminals, as well as outlying points to maintain diesel wheels in service



Wheel grinding of B&O locomotive wheels is done at the Cumberland, Md., shop on a Whiting wheel grinding machine.



Wheels of units in mountain service are restored on a standard wheel truing machine at Nelson, B.C., on the CPR.

under locomotives a maximum amount of time. Any of the wheel defects, particularly hollow tread, contribute to reduction of traction and result in wheel slippage and flashover, in excess of that experienced with good wheel contour maintenance, proper wheel tread, and flange contour, as well as concentricity, have a noticeable effect on reduction of wear on truck frames and boxes.

Excessive wheel wear will not exist on one side only, except on districts where locomotives are continuously operated in the same direction, unless improper maintenance is taking place.

Lateral is controlled by maintaining journal length within the prescribed limits and also renewing solid bearings, whenever they are worn to the point where they permit excessive lateral. Thrust bearings should be carefully checked and maintained in proper condition on installations requiring end thrust plates.

Thermal cracking results from severe braking at high speeds. Checks on the wheel treads or flanges may develop into cracks, which must be turned out before they become dangerous. Resistance to thermal cracking is improved by lowering the carbon content of the steel. Flange thermal cracking caused by flange type brake shoe and other type brake shoes, not being in line with wheel tread, causing rim and tread cracks. Shelling is due to a fatigue break-down of the tread metal under heavy loads. The break-down is greatly accelerated if certain abnormal equipment conditions exist and may occur under a relatively light static load. Resistance to shelling is provided by increasing the strength of the tread metal. In estimating the carrying capacity of a wheel, its diameter, as well as the load is considered. The larger the diameter, the greater is the area of contact between wheel and rail and the lower the stress for a given wheel load. For this reason, wheel loads are given in terms of pounds per inch of wheel diameter.

High strength and higher carbon content are required for maximum resistance to shelling. On the other hand, thermal cracking is minimized by lowering the carbon content. The two causes of failure, thermal cracking and shelling, call for remedies which are opposite of each other. For this reason, it is not possible to specify precisely the appropriate class of wheel for the severity of service, which develops under various conditions. If wheels are run continuously under conditions of unduly high stress in the tread, shelling is to be expected. Shelling also starts sometimes from slid flats or skid spots in the tread. Spalling, another tread condition, sometimes classed as shelling, consists of a breaking out of small portions of tread metal between closely spaced thermal checks.

Flange lubricators are important in reducing flange wear, if properly maintained. The type recommended to this committee is the graphite or disulfide sticks carried through heavy cast flanged shoes and shank and give best results in yard service.

MILEAGES EXPECTED FROM WHEELS

Freight Units Assigned to Los Angeles-San Francisco and Los Angeles-El Paso Service

New Wheels	190,000 miles	
1st Turning	140,000 "	
2nd Turning	64,000 "	(14%)

Units Assigned to Los Angeles-Bakersfield Service (Curved Territory)

New Wheels	80,000 miles	
1st Turning	62,000 "	
2nd Turning	55,000 "	(40%)

Passenger Units Having Six-Wheel Trucks Assigned to San Francisco-El Paso Service

New Wheels	130,000 miles	
1st Turning	110,000 "	
2nd Turning	102,000 "	
3rd Turning	37,500 "	(36%)

Wheel Truing Machines

A wheel truing machine, manufactured by the Standard Railway Equipment Company, was installed at the Los Angeles Shops of the Southern Pacific and placed in service on April 21, 1954.

In order to justify the purchase of this machine, representing an investment of $210,000, a detailed study was made of the costs of turning wheels in a lathe versus the estimated cost of turning wheels in wheel turning machine. A detailed study of the life of 100 scrapped wheels, for which records were available, was also made. As an item of interest, the wheel mileage obtained, as revealed by this study, is repeated in the table.

Based on these wheel mileages and the assignment of units as of April 30, 1952, it was estimated that the wheel truing machine would result in an annual saving of $35,000.

The machine was placed in service on April 21, 1954, and until January 31, 1955, a total of 1,365 pairs of wheels were turned. Actual cost records indicate a saving of $57,794.85. The financial savings was considerably more than anticipated, although some of this is due to the larger number of units now being maintained than were being maintained when the original study was made.

Two of the most important problems facing maintenance forces have been virtually eliminated; that of removing and turning out flat spots on diesel switchers, and the removing and turning of wheels on six-wheel, three-motor trucks. So great has been the saving and convenience through the use of the machine that the locomotives not regularly maintained at the Los Angeles shops have been worked to this point for wheel turning only, from as far as El Paso. Steam locomotive tank wheels, truck wheels, and electric locomo-

tives of the Pacific Electric have also been handled.

Wheel Grinding Machine

A wheel grinding machine, developed to grind worn diesel wheels in place, was purchased by the B&O from the Whiting Corporation and installed March, 1953, at Cumberland, Md. The machine was placed in a pit 20 ft long x 16 ft wide x 10 ft deep. It consists of right and left grinding wheels in separate structures, each with controls and 40 hp motor. Electrical controls for all motors, including hydraulic, are located on floor along side of pit. A lifting structure, housing two rotating shafts, with grooved roller at either end, for supporting flanges of wheels, is supported on four hydraulic jacks. A 5 hp gear reduction motor is also housed in the lifting beam. This drives the rotating shafts which turn locomotive wheels. An 800 gal coolant tank is also part of the machine. Grinding wheels used are 36 in. x 20 in. x 8 in. with face shaped to match contour of locomotive wheel. Plunge type grinding is used.

Set-up time is held to a minimum because no part of the locomotive is handled. That is, the brake rigging, sand piping, journal boxes and electrical equipment are not removed or disconnected in any way. After a locomotive is spotted, wheels are lifted and rails moved from under them hydraulically. Movement of two levers controls these operations. Blocks placed under pedestals support frames and blocks between boxes and pedestals keep boxes rigid when hydraulic pressure is reduced. Grinding starts three minutes after locomotive is spotted.

Two machinists operate the grinding wheels from positions in the pit. All hoist and feed controls and start switches are located at operator's position. Feed for the grinding wheels is automatic after they are lined up by operator.

The time required to bring a pair of wheels back to contour, of course, varies with the condition of the wheels. At present, this time is 40 min. for wheels that have been ground within a three month period, to 1 hr. 20 min. for wheels with high flanges. An average of a wheel an hour for two tricks a day is the production of the wheel grinder at the present time.

This wheel grinder is specifically designed to be used as a maintenance tool rather than a defect-correction tool. A minimum of grinding stone wear is experienced, and a maximum wheel life is obtained when wheel tread taper is maintained and proper flange contour is maintained at a regular period without excessive wear existing at the time grinding is done.

Road freight locomotives, in average service, have wheel tread corrections over the grinder after approximately three months of service. This varies in mileage from 25,000 to 30,000 miles. A minimum correction of tread taper to eliminate minor hollow wear with very little correction of the flange is all that is required on each pair of wheels at this time. Proper maintenance of the taper gives a maximum result in reduction of flange wear. The present wheel grinder is used primarily for grinding diesel locomotive wheels, but this grinder has been used to grind passenger car and freight car wheels successfully, and may play an important part in car wheel maintenance in the future.

The report was prepared by a committee of which O. L. Hope, mechanical superintendent, MP, was chairman.

What's Ahead for Foremen?

With the types of equipment now in service on the railroads, the supervisor must be a perfectionist. Anything less than the best is not good enough. Similarly in his relations with the men who work in his department, he must be meticulous in his relationships. The men must be taught carefully and in a manner which induces them to take personal pride in their accomplishment. These things the LMOA report on the "Foreman Problem—Present and Future" states are essential to profitable railroad operation.

The report continues to say that if the foreman is to be successful in dealing with people then he in turn must also be dealt with in the same manner so that his attitude will represent the very best of which he is capable. If he successfully deals with people, then in order to bring about the desires of the administrative officers, he must be familiar with all that is desired in the way of instructions, modifications, maintenance practices and technical know-how.

It has been said many times that the supervisor controls the purse strings of the railroad since by his decisions money can be spent unnecessarily. It is therefore essential that he be familiar with costs.

Many railroads in the past waited until a vacancy occurred and frantically and rapidly picked someone to fill the vacancy. In many cases due to the press of time they made regrettable mistakes. It is highly desirable, the report states initially, to select an employee who has the characteristics that will allow him to develop into a competent supervisor.

Four cardinal qualities listed as those needed for a successful supervisor are:

- Ability to think;
- Inner drive and work;
- Ability to assume responsibility;
- Ability to deal with people.

The report concludes with the statement: "We cannot over-emphasize the fact that since this man's most important function is representing the management to the worker, his selection should be given careful and considered thought and it should represent one of the most important tasks in the top management of the mechanical departments of the railroads of this country.

Discussion

Probably no subject in the railroad field is now receiving more intensive attention than that of selecting, training of working with the mechanical foremen and supervisors. These men are the link between workers and mangement and the situation is complicated by the fact that a part of the foremen are now organized.

A show of hands during the discussion indicated that foremen are organized on a little less than half of the railroads represented.

The present need is to improve the existing situation and provide effectively for the future. No railroad representative admitted having any difficulty with any of its organized foremen, but all conceded to the fact that there is a basic problem.

It began first with the overtaxing of foremen, and was intensified by the dropping of apprentice programs by many railroads. It was further complicated by the introduction of the diesel with all the differences in shop operation which it brought about.

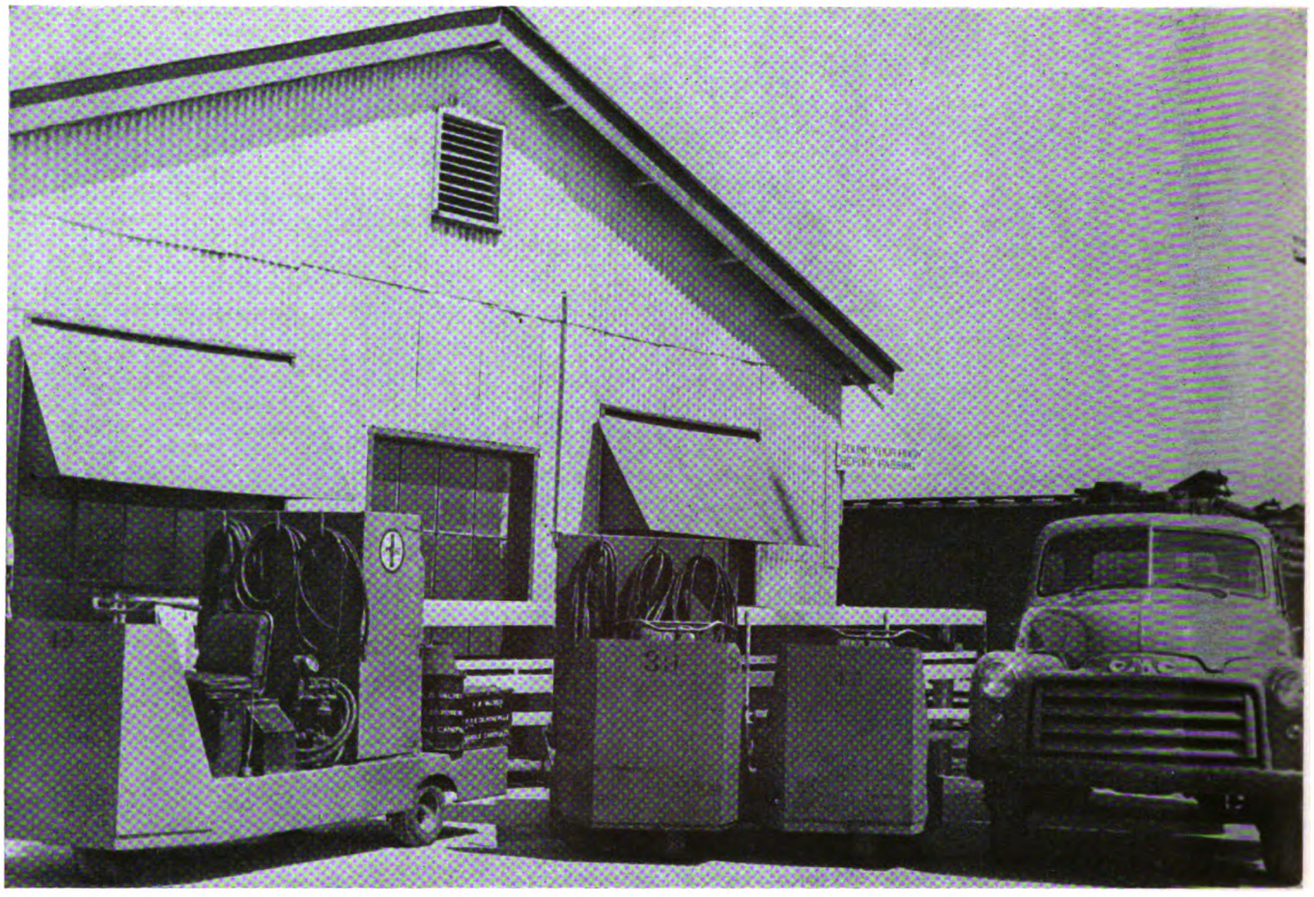
Now the situation is being improved by many means. One railroad has started a training course for foremen which gives them an opportunity to become familiar with the work of all departments. It is open to all supervisors and the men give 16 Friday evenings of their own time for it. It gives those in attendance an understanding of all phases of work in the mechanical department and with plans of management. A second railroad has instigated a similar course which is carried on on company time.

On other railroads, apprenticeship training is being reinstated. When this is done it is considered of first importance, carefully to select "Good Seed," the kind of young men who can develop into good foremen. This is particularly important where foremen are organized since human relations under these conditions are in more delicate balance.

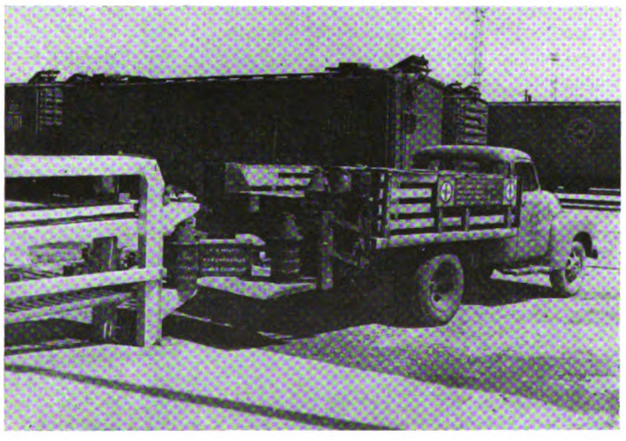
All railroad managements now apparently recognize that the old barriers between management and supervision have cost the railroads much money and must be taken down. Promotions, it was said, should be recommended locally and approved by top management.

Given good foreman material, adequate training and recognition by management, it was felt that an organized foreman would not have a tendency to lean toward his organization for protection. Supervisors, it was said, should be awarded benefits before they are enforced.

One speaker said that with or without organization, supervisory jobs must be made attractive.



Motorized equipment outside Roseville shop.



GMC truck with hydraulic end-gate, unloading pistons and valves into roller conveyor which delivers them into the air-brake shop.

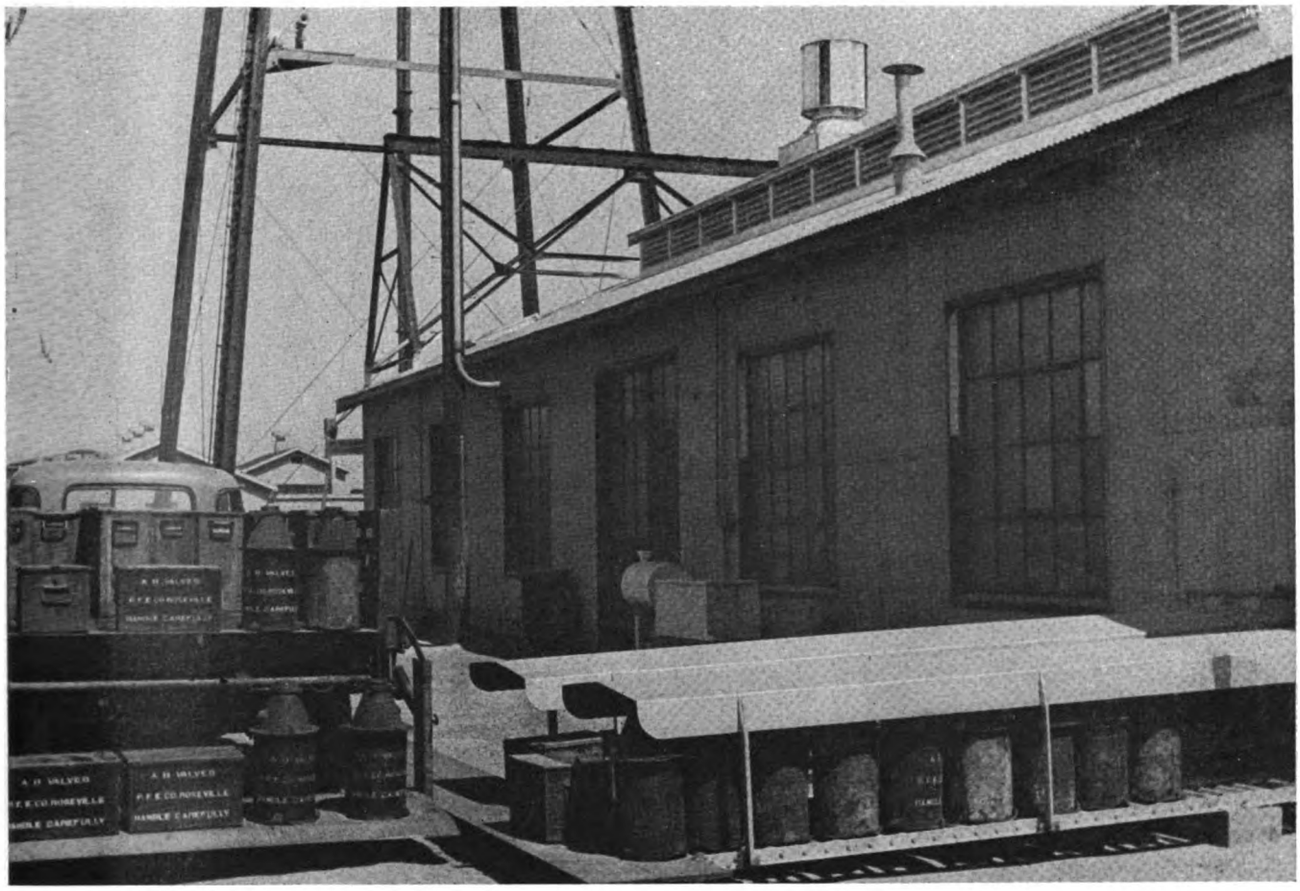
Roseville Air-Brake Shop Revamped

The Roseville, Cal., air-brake shop of the Pacific Fruit Express Company recently has been enlarged and remodeled for more efficient production and now has a daily output of AB valves and brake cylinders stripped, cleaned, repaired and tested, for example, of from 12 to 18 units. This can be further extended to 28 if and when the demand necessitates. It is estimated that the annual savings as a result of these improved shop facilities will be at least $5,000.

The original air-brake room, built in 1928, was 25 ft long and 30 ft wide, and all material and supplies were handled manually. Valves and brake cylinders brought to the front door of the shop were moved by push carts, hooks and pulleys to work benches where they were placed for cleaning. This operation was performed with wire brushes and scrapers, and to the extent possible dust was blown from the valves by compressed air.

With the revamped facility, now 50 ft long and 30 ft wide, valves and brake cylinders are brought from the car repair yard to the air brake shop in trucks and pallets, placed on conveyor lines and rolled in to the shop to designated locations for handling.

Valves—service and emergency portions—are run through a sandblasting machine and then moved by monorail to a rack or shelving at the rear of workmen



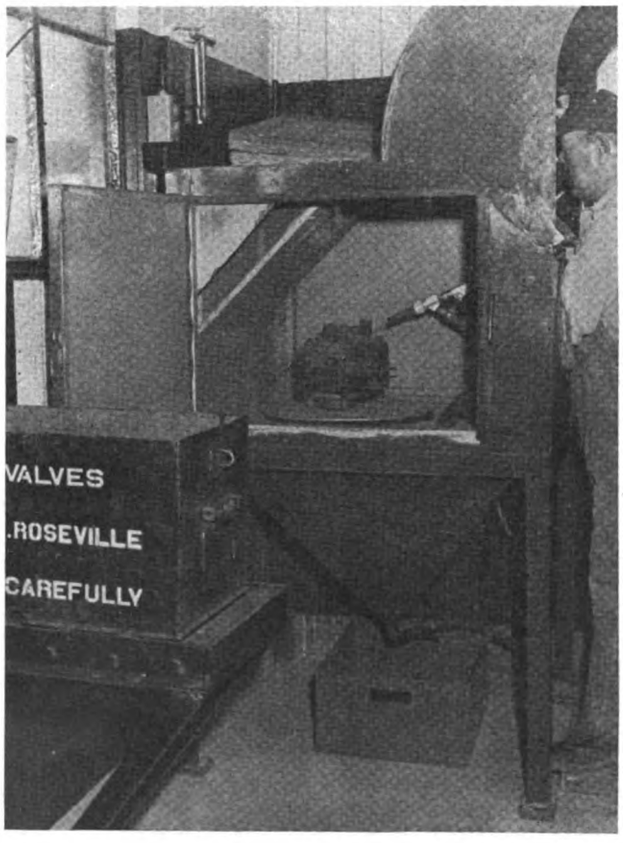
Gravity delivery of repaired parts.

Mechanized handling as well as suggestions of shop men are used by Pacific Fruit Express

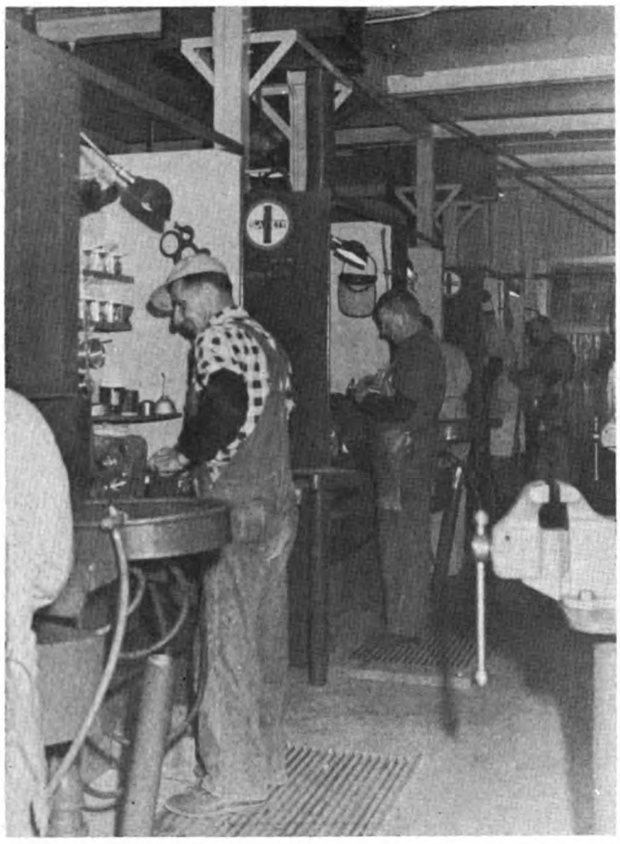
for cleaning and repairs. After a valve has been overhauled it is passed to the test rack for final test and approval. It is then placed in a metal container, put on conveyors and rolled through the shop wall to a loading platform outside.

Brake cylinder assemblies are handled in a similar manner, after being received in air brake shop in containers. Workmen remove pistons and piston rods from containers to be run through regular cleaning and polishing process. Later they are greased and otherwise readied before being placed in containers for distribution to various parts of the yard.

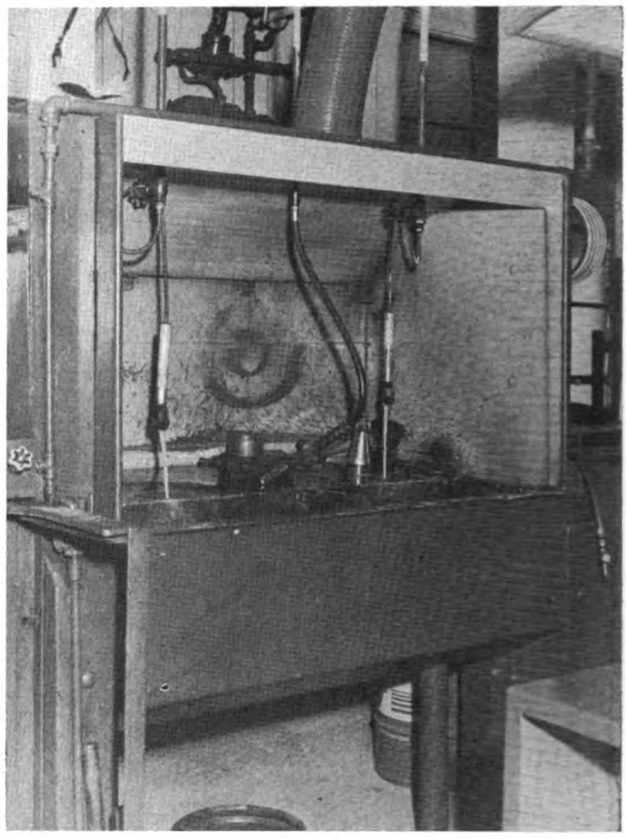
A large amount of motorized equipment is required to expedite work at the Roseville shops and repair tracks. Four units used by outside crews in cleaning, testing and



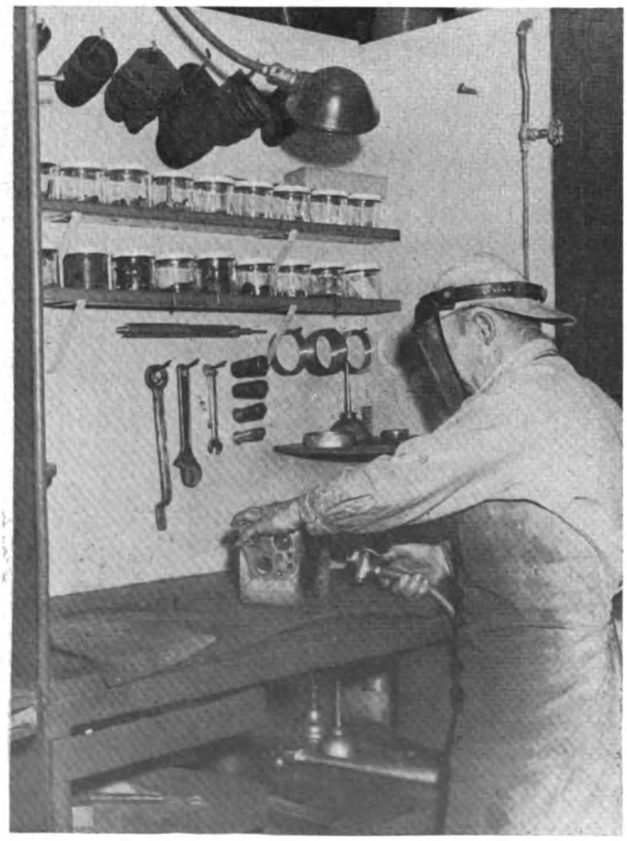
Sandblast unit used in cleaning AB valves. All dust is removed in water filter, thus keeping the shop air clean.



Line of AB valve repair positions. Pipe extending up from the shop floor holds impact wrench used in dismantling and assembling valves. Individual valve repair position showing special tools, gaskets, small parts, containers and hinged drawers.



Pistons are handled at this station where they are both cleaned and polished. Filter-cleaning fluid comes out of the nylon brushes. A central spray permits washing these units while they are being worked on.



repairing air brakes in the yard are shown in one illustration. They include two Kalamazoo speed wagons, No. 39 and 40, equipped with everything necessary to do a complete "COT&S" job. Speed wagon No. 45 is used for pickup jobs such as blown-out cylinder gaskets, broken pipe, etc. The GMC truck at the extreme right is used for delivering all AB valves and pistons, also journal box packing to the individual cars. It is also used to pick up AB valves, pistons and scrap journal box waste. At the left in the same illustration is the covered roller conveyor which delivers repaired air-brake parts by gravity out of the shop where they are loaded on the GMC truck for delivery to the storehouse or repair track.

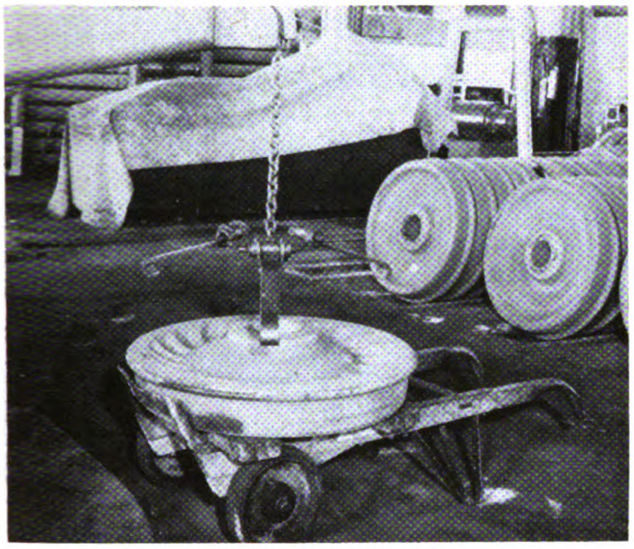
This shop is equipped with a ventilating system which keeps the interior free of fumes, dust, etc. An oil-delivery system supplies cleaning fluid to each position in the shop where it is needed. After being filtered, this fluid is also reused.

In developing plans for modernizing the Roseville air-brake shop, local shop men were urged to submit ideas which, in the aggregate, represented many years of experience with every detail problem encountered in repairing air-brake parts.

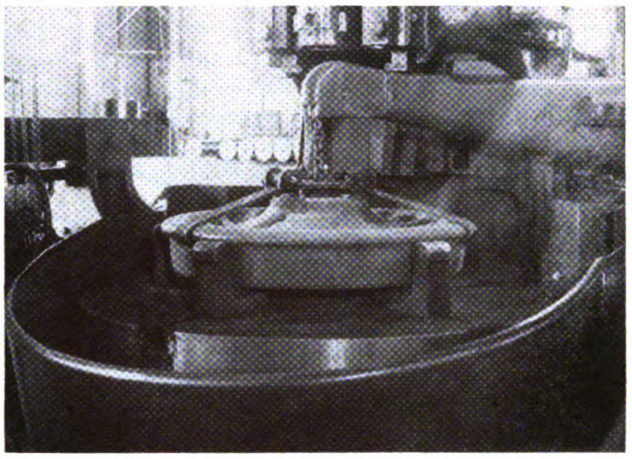
The inclusion of many of these ideas in the new shop design and equipment was an important factor in assuring not only comfortable, convenient working conditions, but efficient operation.

Individual valve repair position, showing special tools, jackets, small parts, containers, and hinged drawers.

Ideas for the Car Repair Man...



Automatic lifting device ready to engage car wheel at Sacramento shop of WP

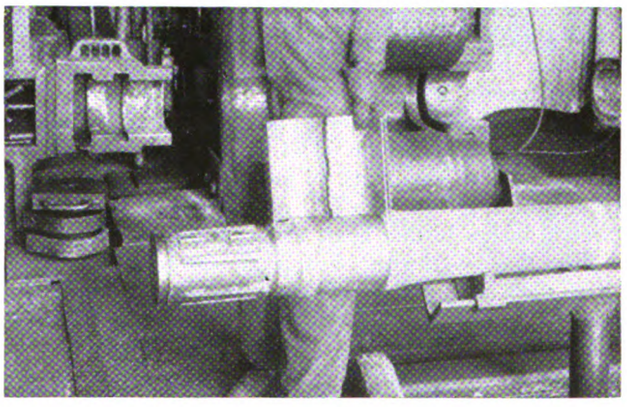


How the lift looks when applying car wheel to boring mill

BORING MILL WHEEL LIFT. The car-wheel lifting device, illustrated, is used at the Sacramento shops of the Western Pacific in loading and unloading boring mills. It is said to be notably superior to the ordinary plug-and-bar type lift because it combines safety with almost fully automatic operation. The lift consists of an 8-in. diameter center piece cut out of ½-in. steel plate with a torch and having three pairs of equally spaced ears, turned up and drilled for ¾-in. by 5-in. button-head rivets spaced 5½ in. from a 1½-in. center hole. Three ½-in. by 2-in. bars are turned up at one end to fit snugly around the button-head rivets and bent at the other end to fit the car wheel flange, the distance from rivet center to point of contact with the flange being 13½ in. A lifting chain is passed through the center hole and anchored in a steel disc 4½ in. in diameter by 2-in. thick which also fits in the car wheel bore and thus centers the device when it is first dropped on the wheel.

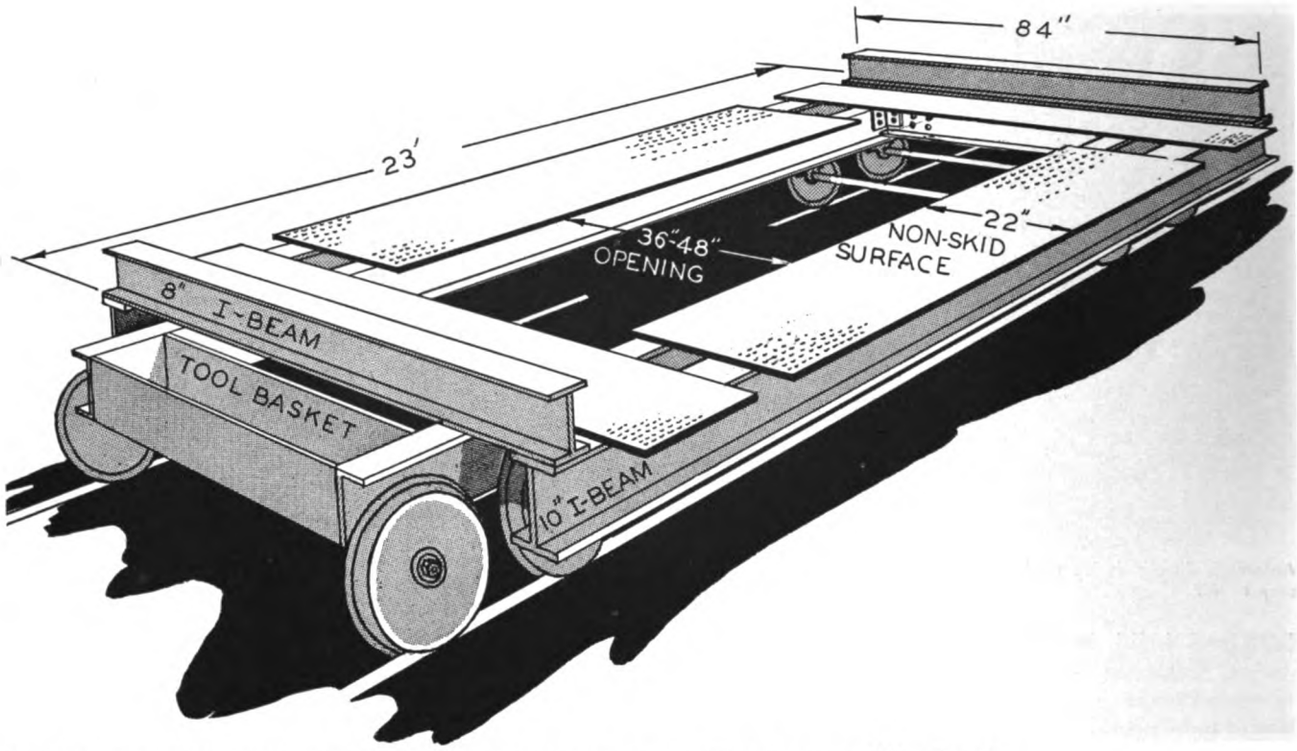
One of the illustrations shows the lift suspended by a chain from the boring mill loading arm and ready to engage a 33-in. chilled-iron car wheel resting on a hand truck. When dropped still further, the 4½-in. disc enters the car wheel bore, centering the device and the three holding bars slip around the wheel flange. An upward pull on the chain shortens the radius of the holding bars, causing the rounded ends to grip the flange firmly. This is all done without any manual handling, and after the wheel has been elevated, swung over the boring mill table and dropped in the chuck. The manual release of any one of the three arms permits the lifting device to be raised and swung clear of the table.

JOURNAL PROTECTOR. A hinged journal protector is used as a safeguard when mounting car wheels on axles in the wheel press at the Western Pacific shops, Sacramento, Cal. The former practice of applying pieces of felt around the journals was found unsatisfactory because of inadequate journal protection and also because the felt strips had short service life. The next step was to use galvanized halves with felt riveted in place to protect the highly-finished journals, but this method also gave limited protection and the halves had to be held on to journals by hand, at least when starting wheel bores over the journals. The present method is to make the half sections of hinged black iron with 20-gage copper fitted and riveted to the inner surfaces. Six taper longitudinal bars welded to the guard help guide it through the bore as the wheel is pushed over the journal to the wheel seat.



One journal protector in place and another opened up to show construction

Ideas for the Diesel Repair Man...

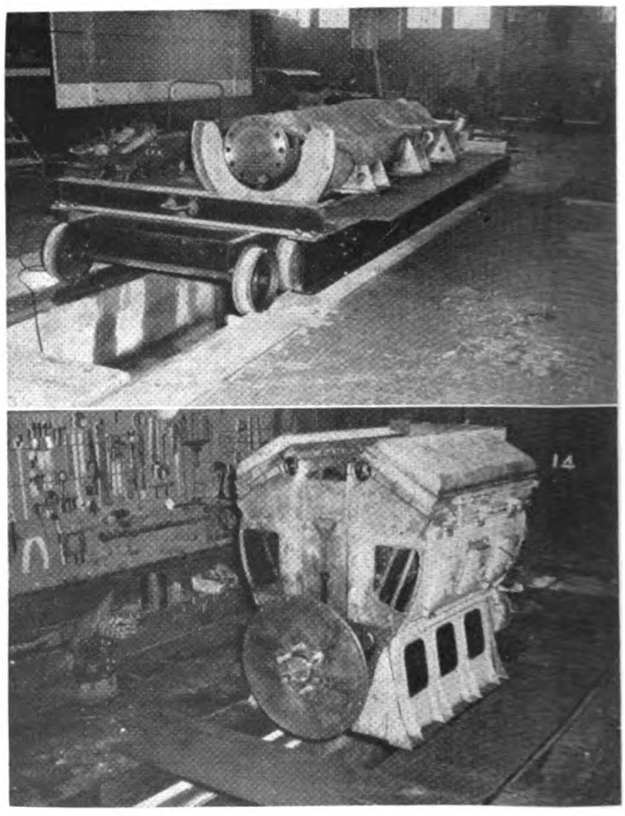


The inside center opening can be adjusted from 36 to 48 inches and can be different at one end than the other

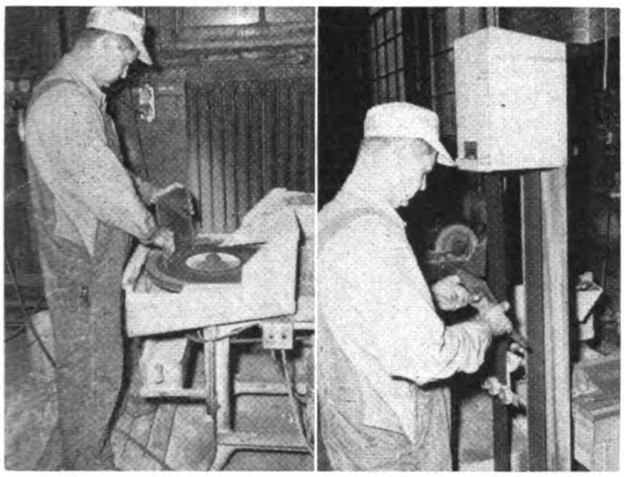
ADJUSTABLE FRAMES FOR ENGINE REPAIRS. The Terminal Railroad Association of St. Louis has built two work stands for diesel engines which can be adjusted to accommodate models ranging in size from GM 6-cylinder to BLW 8-cylinder engines. The stands have several advantages. They provide a platform for working along each side of the engine while at the same time leaving an open space in the center for working from the shop pits. The stands ride on eight flanged wheels to move the engine to the cleaning rack and to other places within the shop.

The main lengthwise members of the stand are 10-in. I-beams which join to another pair of 10-in. I-beams at each end. The lengthwise and crosswise beams are tied together by an angle plate and bolts. The transverse beams have a series of holes to permit the opening between the lengthwise beams to be varied from a minimum of 36 in. to a maximum of 48 in. The opening need not be the same at both ends. In fact, for removing the main generator from an Alco 539 engine, the beams must be several inches further apart at the generator end.

The two lengthwise I-beams are covered by a 22-in. wide plate with non-skid surface running the full length (23 ft) of the beams. Nonskid plates also extend across the extreme width (84 in.) at each end and a steel box is included at each end.

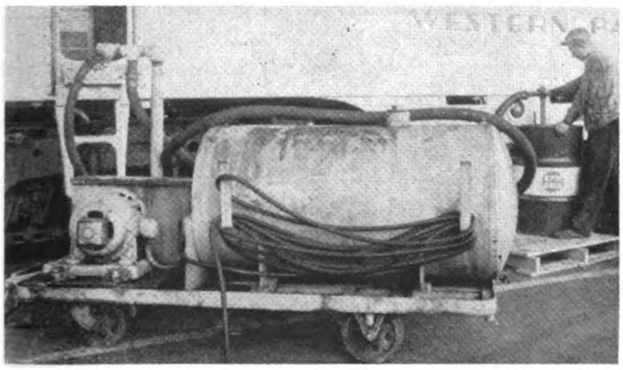


The stand can be adjusted both lengthwise and crossways to accommodate all sizes of switcher diesel engines



Equipment for making small windows from broken large windows includes a grinding wheel and a continuous belt

SWITCHING LINE MAKES OWN GLASS. The Terminal Railroad Association of St. Louis makes many of its own windows—of both safety glass and regular glass—for cabooses and diesel switchers by cutting down broken sections of large windows. The total operation is done with the aid of a standard layout and cutting table, a continuous belt edger and a grinding wheel. The finishing work is done wet, using a water spray on the bottom of the belt and an abrasive with the grinding wheel.



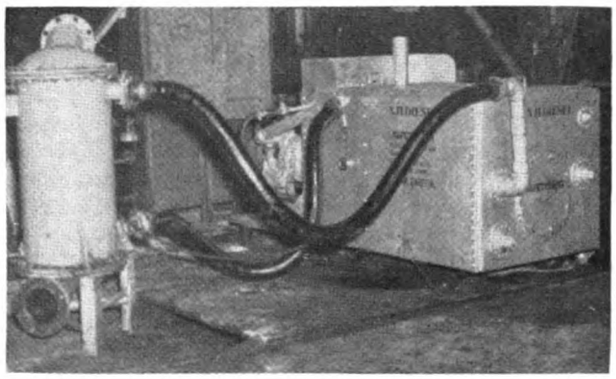
An efficient oil-supply trailer transferring lubricating oil from a drum of RPM Delco to a diesel unit at the Sacramento shop of the Western Pacific

DIESEL LUBRICATING CART. Diesel locomotive servicing points, especially the larger ones, are generally equipped with a colored pipe system and convenient outlets to supply lubricating oil to diesel units. But not all shops service enough diesels to justify the piping installation cost. In such cases, the fuel cart or trailer (illustrated) used at the Western Pacific diesel shop, Sacramento, Cal., will be found quite efficient and better than the practice sometimes followed of lifting individual oil drums, one at a time, with a crane and allowing oil to run slowly into the 200-gal tank on the locomotive until it is filled.

The oil supply trailer frame is 5 ft long by 3 ft wide or large enough to accommodate all necessary oil storage, pumping and control valves. The 60-in. by 31-in. diameter oil tank has a capacity to hold 300 gal, or more than enough to fill the oil tank on one diesel unit. A diesel lubricating oil pump, mounted on the trailer frame, is driven through suitable gear reduction from the 5-hp electric motor shown.

The piping and shut-off valve connections are such that oil may be quickly transferred from oil drums into the oil storage tank on the trailer or direct from drum to oil tank on the locomotive. A 53-gal oil drum can be emptied in 2¼ min.

The oil supply trailer can also be used when pumping oil from barrels to storage in the stores department, when emptying or filling tank cars, or for any other lubricating or fuel oil transfer job.



Washing machine for lube oil coolers

CLEANING OIL COOLERS. Lube oil coolers from New Haven's Alco locomotives with 244 engines are cleaned with this washing machine designed and built by the railroad and used in the diesel shop at New Haven, Conn. The tank holds about 300 gal of cleaning solution. This solution is pumped from the tank by the motor-driven pump and into the flanged connection at the bottom of the cooler. It passes between the tubes and through the top flanged connection back to the tank. The New Haven has found that the movement of this large volume of solution through the cooler is effective in removing sludge.

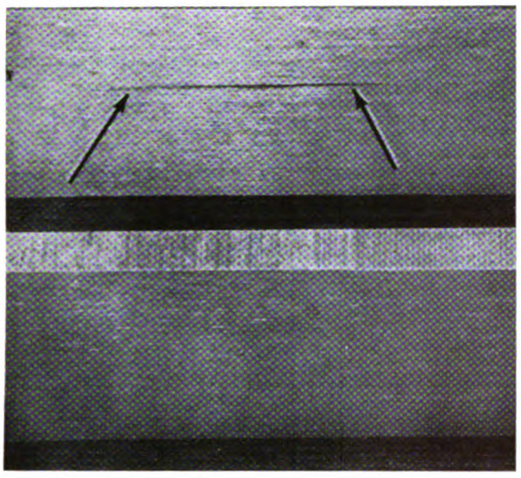


Fig. 1—Gear teeth, showing typical inclusions.

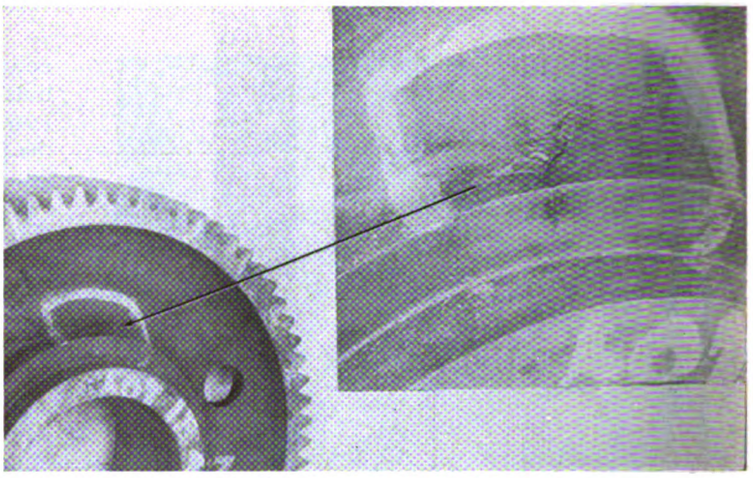


Fig. 2—Gear with forging lap in hub fillet.

Detecting Flaws in Traction Gears

Magnetic particle testing, because of its simplicity, sometimes deceives inspectors and causes them to reject gearing for any indication of surface irregularities. This may result in unnecessary scrapping of many gears and pinions through failure to recognize irrelevant indications and allow for variations in inspection techniques.

For instance, the sensitivity of the test will depend upon whether alternating or direct current is used. Because alternating current tends to flow principally along the surface of the conductor, the resulting magnetic field is limited to the metal near the surface of the part being examined. Direct current, on the other hand, penetrates more deeply into the material and therefore will show sub-surface irregularities. Since surface flaws on gear teeth are of the greatest concern, the magnetic fields produced by alternating current will be suitable, provided sufficient strength of field (ampere turns) is used. In general, the magnetic field should approach saturation. This state is reached when the leakage flux causes a build-up of magnetic particles at sharp corners, or points where the section changes. A commonly used check of the magnetic field strength is to note whether a paper clip is attracted to the magnetized surface.

Residual Magnetization Not Satisfactory

In many cases, the residual method of magnetization is used rather than the continuous method. As a general rule, the residual magnetism method should be avoided because of the difficulty in obtaining a field intensity strong enough to give a clear indication of defects.

This is an abstract of a paper by J. B. MacPherson and A. H. Prucknicki, both of General Electric Company, presented at the Fall General Meeting of the American Institute of Electrical Engineers, held in Chicago, October 3-7, 1955.

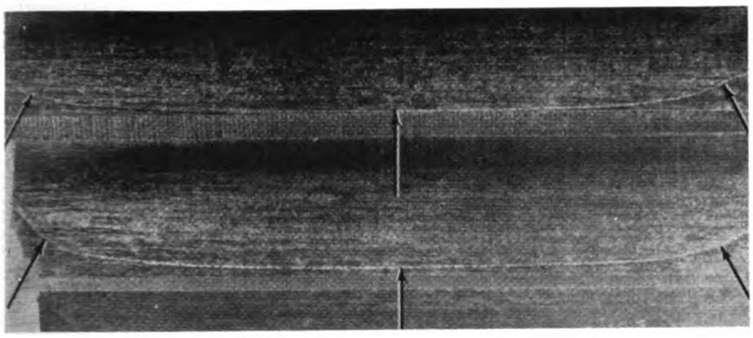
If you know how to look and know what you are looking at, many gear failures can be avoided without unnecessary scrapping

An important factor in determining the sensitivity of the test is the type of inspection medium used. For instance, a weak field will attract coarse elongated particles. These will produce visible indications, but they require tedious examination to be certain that the flaws are noted. These same weak fields would probably produce no indications with very fine particles in a wet inspection medium.

Another factor affecting sensitivity of the inspection is the direction of the field with respect to the flaw. Flaws parallel to the field will give the poorest indication, and flaws at right angles to the field will give the best. Fortunately, surface flaws in traction gearing are usually unidirectional, so two inspections with fields at right angles to each other are not necessary. Since the flaws are in an axial or nearly axial direction, the field should be at right angles to this, or in a circumferential direction.

Once an indication has been observed and classified, the decision to be made as to acceptance or rejection of gear with the flaw. Only gears of sufficient quality to render satisfactory service for the desired life of the unit should be accepted. Standards of acceptance and rejection must, therefore, be based on a thorough understanding of what can, and cannot, be tolerated in service.

The decision as to acceptability of a part should not



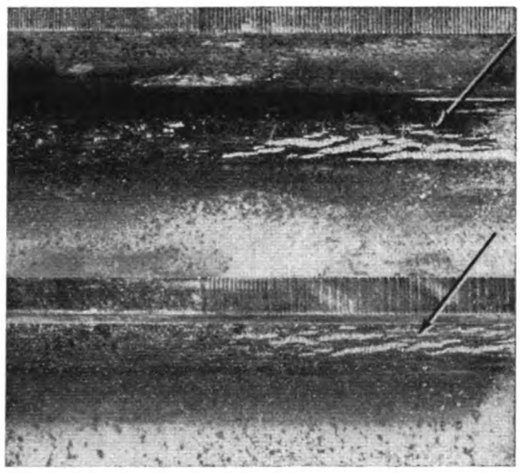
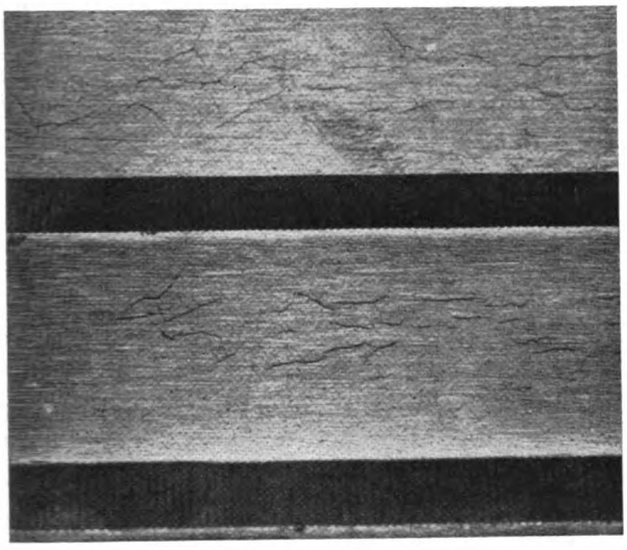
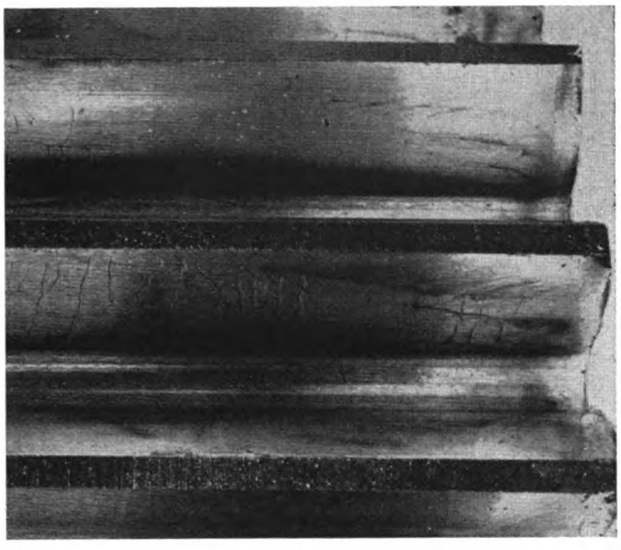


Fig. 3 (above)—Piston with quench cracks in teeth.
Fig. 4 (at right)—Pinion, showing tear marks at the roots of the teeth.
Fig. 5 (lower left)—Grinding cracks forming a chicken wire pattern.
Fig. 6 (lower right)—Grinding cracks forming a fish-tail pattern.





necessarily be based on the presence or absence of such things as forging folds, cracks, inclusions, or other abnormal conditions. Rather, it should be based on how the conditions found will affect the usefulness of the part. All imperfections are not necessarily defects requiring rejection of the part. If this fact is not properly recognized, inspection may be over-critical and satisfactory parts may be rejected. Since the major factor in judging the acceptability of a part is its performance in service, the value of any non-destructive test should be measured by the performance of the parts which have been inspected by this means and approved. The purpose of any periodic inspection in a maintenance program is to assure that the part is as good as necessary for this particular function and service. Inspection results should be considered and judged from this point of view.

The flaws usually observed may be grouped in three classes: material, manufacturing and service flaws.

Material Flaws

Since the bulk of railroad gearing is made from forged or rolled blanks, the material flaws encountered will be in the form of inclusions, or forging laps or folds. Inspectors are generally familiar with the characteristic indication of an inclusion, therefore, it will not be described; but a typical inclusion is shown in Fig. 1. Forging laps, on the other hand, are not so well known. This type of flaw occurs in fillets or at locations where section change, such as at rims or hubs. Usually, it penetrates straight in from the surface. A forging lap in the fillet between the web and hub of a gear is shown in Fig. 2. Forging laps do not occur in pinions. In this case, the blanks are hammer forged or manufactured from bar stock, hence it is impossible for the metal to have been folded or lapped on itself.

The presence of forging laps is not necessarily a cause for rejection of the part. Hubs and rim fillets are regions of relatively low stress and, therefore, forging folds or laps in these areas either will not increase in size or, if they do, the progress will be very slow. When forging defects are found, they may be ground out, provided their depth does not exceed ¼ in. The bottom of the grind should be rounded to avoid unnecessary stress raisers. This figure of ¼ in. is a rule of thumb, and hence only approximate. For instance, if the web is particularly thick and the bottom radius of the grind is generous, the ¼-in. depth may be exceeded. These ground areas should be checked annually to insure that cracks do not propagate in them.

Subsurface inclusions, particularly in tooth root areas, are important to the gear manufacturer as indications of the quality of the material. The more serious inclusions

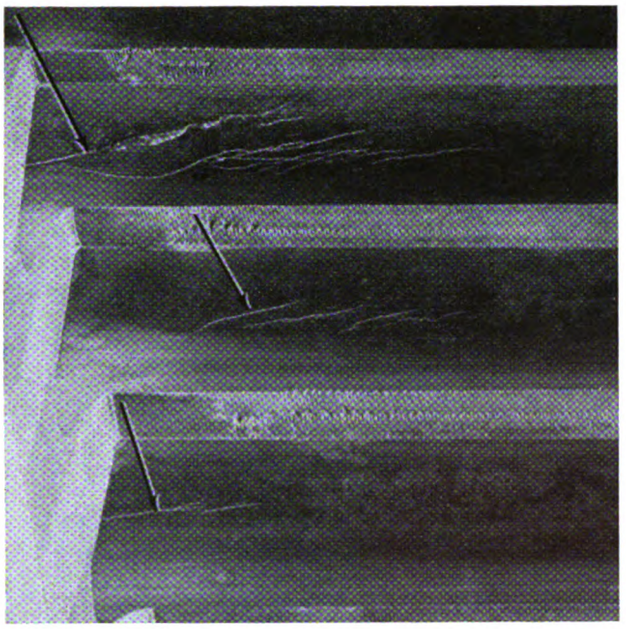


Fig. 7—Typical fatigue cracks in gear teeth.

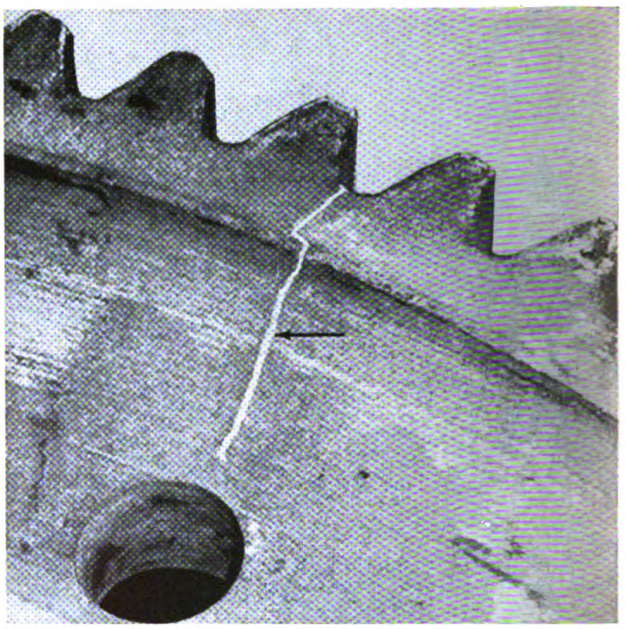


Fig. 9—Radial fatigue cracks in gear rim.

are those on the surface. If these are long and numerous, they may serve as starting points for fatigue failures. However, cases of fatigue failures on traction gearing starting from inclusions have been rare.

Manufacturing Flaws

Several types of indications might appear on gear teeth as a result of operations performed during manufacture. Quench cracks, machine tear marks, and grinding cracks are the most common causes of this type of indication.

Quench cracks result from unequal cooling rates in adjacent sections during the quench cycle of heat treatment. These cracks generally form at the ends of the teeth in the root area. Figure 3 shows typical quench cracks. Fortunately, such cracks are easily detected because they are usually long and deep and give strong indications. In most cases, the manufacturer's inspection detects quench cracks, so they are rarely found on gears in service. When quench cracks are found in a service inspection, they are cause for rejection of the gear or pinion.

Qench cracks, such as shown in Fig. 3, indicate a heat treatment problem. Sometimes it is difficult to distinguish them from fatigue cracks, and they should be judged as if they were fatigue cracks. The greatest danger from the presence of quench cracks is that part of the tooth may break at the crack and lodge in the mesh. Since quench cracks are fairly deep, tooth breakage from this cause will occur in the early stages of operation, by rupturing rather than by long-term fatigue. There have been cases where, although one or two teeth on a gear have broken off at the corners because of quench cracks, the gears have operated satisfactorily for a considerable time before the breakage was observed. In such cases, the broken pieces did not lodge in the mesh, but dropped to the bottom of the gear case.

If the break in a gear tooth is from a corner, and is less than 25 per cent of the face width and the teeth adjacent to the broken tooth show no defects, the gear can be returned to limited service. A suggested way to limit the duty on such a gear is to confine its operation to lighter, less critical service. A pinion with a broken tooth, however, should be replaced. This is based on the fact that pinions make more revolutions than gears and therefore wear faster. Also, they cost less and are easier to replace than gears. A gear with more than two broken teeth should be examined closely to be certain there are no other fatigue cracks. It should also be checked for the amount of wear life remaining before deciding to retain it in service.

Machine tear marks are found only in the roots of teeth on protuberance-hobbed gearing. They never occur in gearing with fully ground teeth. These marks are believed to be caused by chips interfering with the flutes of the hob. A pinion with typical tear marks is shown in Fig. 4. They are very shallow in depth and in length. Their distribution is very random, and they always occur in an axial direction. Tear marks are not a cause for scrapping the gear or pinion.

Grinding cracks result from an excessive rate of grinding. This may be caused by either too fast a grinding wheel speed or too fast a feed of the wheel. Grinding cracks are very fine and generally run penpendicular to the axis of the gear or pinion. In some cases, they form a chicken wire pattern, as shown in Fig. 5. Another common appearance is the fish-tail pattern shown in Fig. 6.

All manufacturers try to avoid producing grinding cracks when grinding teeth. Gears in service found to have grinding cracks should be viewed with suspicion. The manufacturer should be consulted if such cracks are found at the first inspection. Grinding cracks may or may not be harmful. If they are shallow and the tooth loading is conservative—particularly if the gear material is shallow-hardening steel—grinding cracks will not develop into fatigue cracks, but will gradually disappear as wear occurs. If residual tensile stresses occur at the surface as a result of improper heat treating—especially with deep-hardening steels—the residual stresses from the grinding process and the tensile stress from tooth

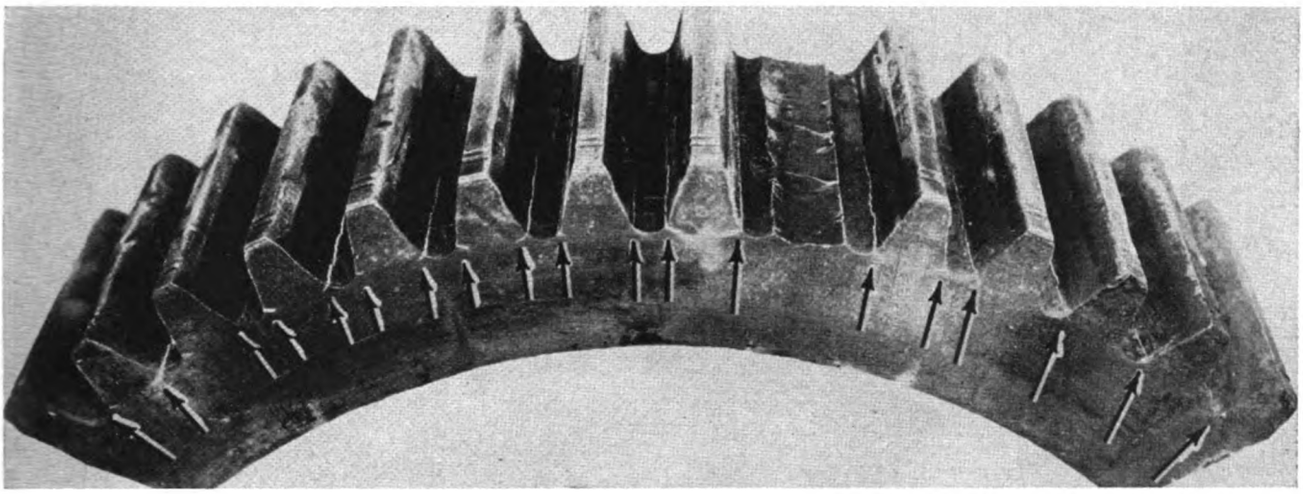


Fig. 8—Axial fatigue cracks at roots of gear teeth.

loading can add up to the point where fatigue failure will start. In such cases, grinding cracks are a cause for rejection of the part.

Service Flaws

The third group of indications are those resulting from service flaws. These flaws, resulting from operation of the gearing, are called fatigue cracks. In most cases, they start at the root fillet on the side near the motor and progress upyard toward the tip of the tooth in a sweeping curve. Figure 7 shows a typical fatigue crack. Some fatigue cracks occur in the roots of the teeth and run axially along the root as shown in Fig. 8. Such fatigue cracks are easily mistaken for machine tear marks if the root is unground. Grinding the indication with a small hand grinder and retesting will determine whether the flaw is a fatigue crack or not. If the indication does not reappear, it was a machine tear mark and not a fatigue crack. An infrequent type of fatigue failure is that in which the crack at the root of the tooth progresses radially in the rim toward the bore, as shown in Fig. 9.

While inclusions and grinding cracks are the orgins of many fatigue failures, end loading of the teeth is probably the greatest single cause. End loading may be the result of shaft deflection, bearing clearances and wear, or misalignment of the motor frame. It is easily detected by examining the teeth to determine the location of the contact area.

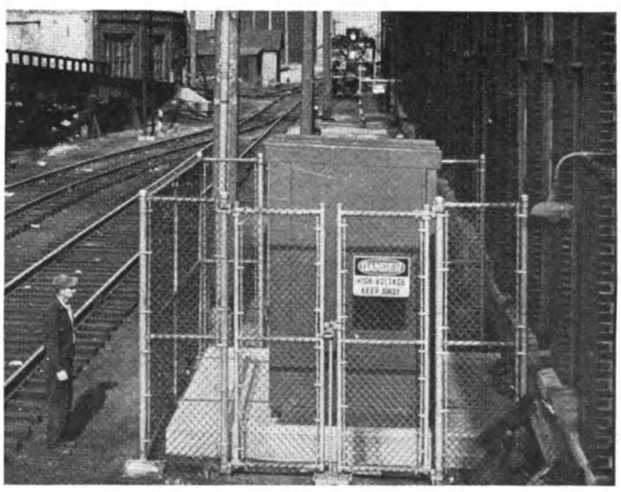
Another cause of faitgue failures is the presence of high residual tensile stresses in the root areas. It is impossible to detect residual stresses except by tedious and expensive destructive testing techniques which are outside the scope of this paper.

The final cause of fatigue failures is surface decarburization. This results in surface areas with low carbon content and, consequently, extremely low fatigue strength and wear life. If decarburization occurs in the root areas on heavily loaded gearing, fatigue failure or broken teeth will result. If it is located on the wear areas of the teeth profiles—particularly if the area is large and deep—the gearing will wear at an excessive rate.

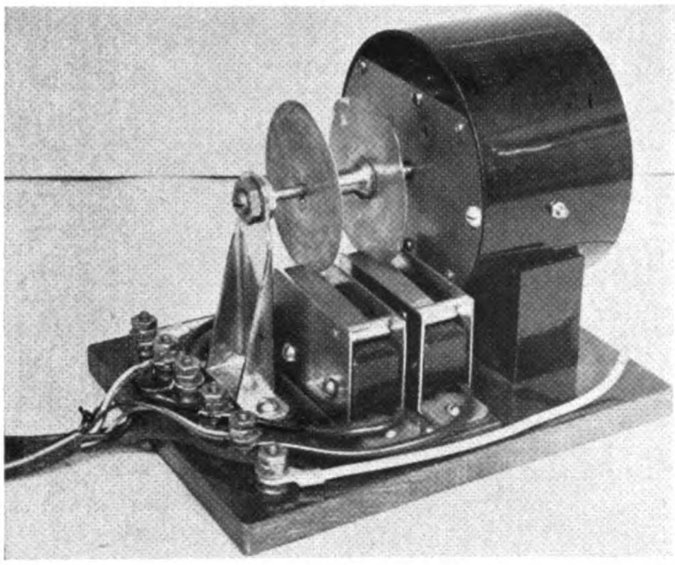
Traction gearing is an exact piece of machinery—carefully designed and accurately manufactured. Hence, it should be properly cared for. Growing appreciation of this fact has brought about a rise in the standards of gear inspection and maintenance on numerous railroads. Intelligent use of non-destructive testing techniques and correct interpretation of the indications obtained, play an important role in this work.

The foregoing discussion has been presented for the purpose of assisting the operator to detect and properly evaluate surface flaws in traction gearing. The data cited lead to the following conclusions:

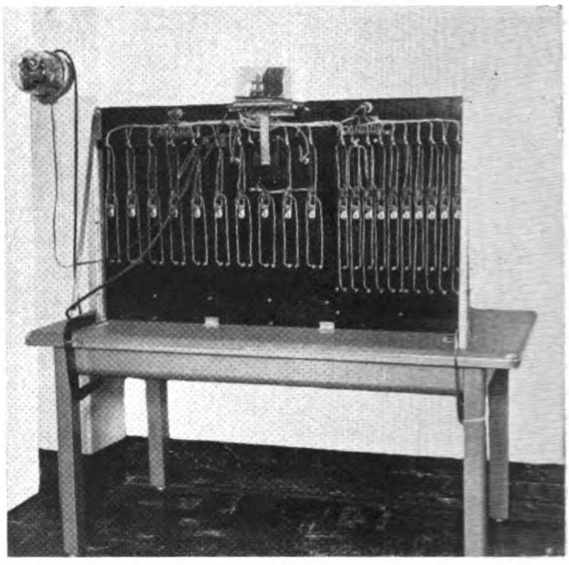
1. Certain inspection techniques are best adapted to indicate flaws of the surface type.
2. Gearing giving indication of flaws need not necessarily be scrapped. In some instances the flaws may be corrected. In other cases, the character of the flaw and the type of service may permit the part to be continued in use.
3. As skill and experience are gained in the techniques of inspection and the interpretation of the results, road failures resulting from gear trouble will be reduced and the reliability level of motive power raised.



Power for 60-cycle tools in New York Central's Harmon, N.Y., diesel shop, has been made available through an outdoor factory-assembled substation supplied by the General Electric Company. Rated at 500 kva, the substation steps the line voltage of 4,160 down to 440 for distribution in the shop. Maximum safety is provided by completely metal-encased equipment and a protective fence.



Bronze wafer discs mounted on the shaft are cut as cams to operate micro-switches and control discharge current.



The d-c relays are in series with the a-c relays so that an a-c failure causes all discharging circuits to open.

Completely Automatic Battery Testing Panel

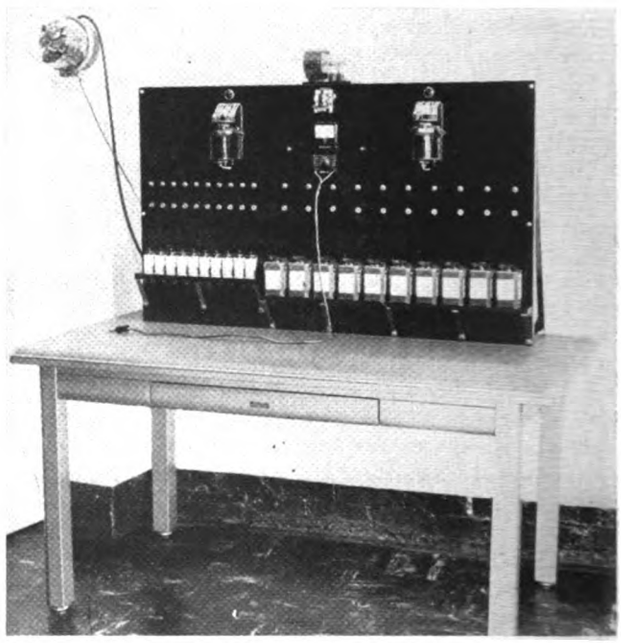
DESIRED QUALIFICATION TESTS on sample lots of dry cell batteries are run by the North Western without the constant attention of a laboratory technician. An automatic cycling panel saves 7½ man-hours per operating day in performing the standard acceptance test while at the same time assuring constant quality control in the purchase of the approximately 25,000 dry cells used each month.

The panel was built through the collaboration of the laboratory and the electrical departments, using available and adaptable equipment both from these two departments. It is controlled by a master time switch operating on 110 volt a-c which activates the panel for a period of 8 hours followed by a 16-hour rest period. This sequence can be repeated on a 7-day time schedule. Or it can be adjusted to come on Monday morning at 8:00 a.m., work 8 hours a day for a 5-day week and shut off Friday at 4:00 p.m., then come back on again Monday morning at 8:00 a.m. It can also, if desired, be run continuously for an indefinite period.

The panel is designed to test ten 1½-volt flashlight batteries and ten 6-volt switchmen lantern batteries simultaneously. The panel time cycling mechanism is controlled by a small electric clock with a small shaft. The shaft is attached to the hour-hand gear and extends outside to a jewel bearing, mounted on a pedestal.

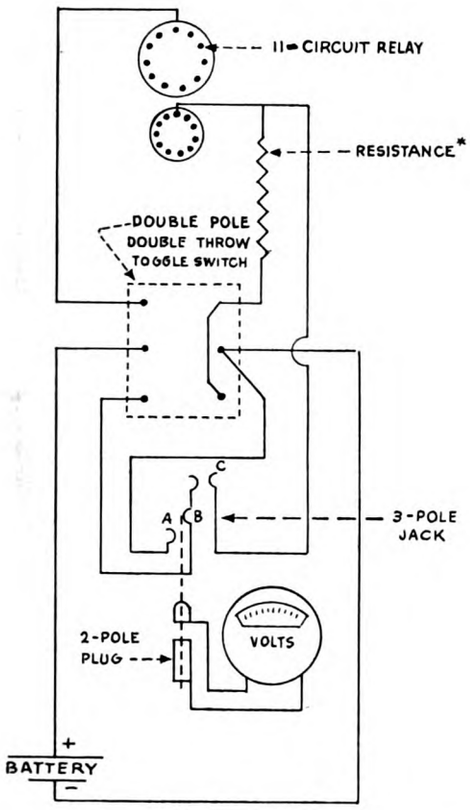
Two 2-in. bronze wafer discs on the shaft rotate with the shaft at the rate of 1 rpm. One disc is cut on the outer circumference to give four equally spaced protruding sections of equal length to operate a micro-switch for four 4-minute periods equally spaced over a period of one hour.

The second disc is cut with a protruding section equal to one-half the circumference to operate another micro-switch for one 30-minute period each hour. Each micro-switch has an extended arm to allow a leverage of 12 to 1. This reduces the pressure exerted by the cam to less than one gram for micro-switch operation.



The panel can test ten 1½-volt flashlight and ten 6-volt lantern batteries simultaneously.

There are two 11-circuit d-c relays, which are energized through the micro-switches, and one wire of each d-c relay is in series with a two-pole a-c relay. Thus, if these is an alternating current failure, and the master time switch stops, all battery discharging circuits automatically open. Each d-c relay has 10 battery discharging contactors and one pilot light contactor. A d-c failure will cause all closed circuits to open. The bronze contactors have sufficient "wipe" to avoid contact failure and the "hold-in" pressure is about one pound.



When the toggle switch is in the *up* position, the battery is discharging. With the toggle switch in the *down* position, the battery is at rest. Inserting the two-pole plug into the three-pole jack only far enough to make contact with the main contacts *A* and *B* causes the battery voltage to be indicated on the meter. Pushing the plug all the way into the jack, closing contact at C, puts the load back on to the battery, and the meter reading is the voltage of the battery while discharging.
*** 4 ohms in the 1½-volt circuit; 32 ohms in the 6-volt circuit**

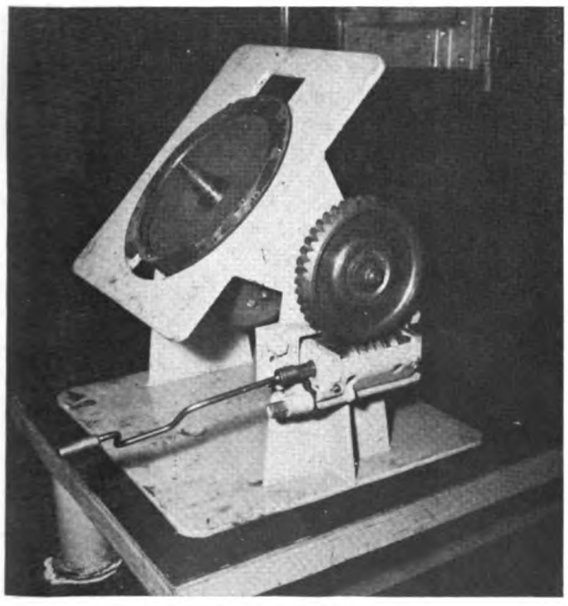
There is a double-pole, double-throw toggle switch and a 2-pole jack in each battery discharge circuit, or 20 separate circuits in all. A d-c voltmeter is connected to a two pole plug which, when inserted part way, engages the main contactors to read the battery voltage without load. If the plug is pushed in further, it engages the battery discharge circuit and load readings can be taken.

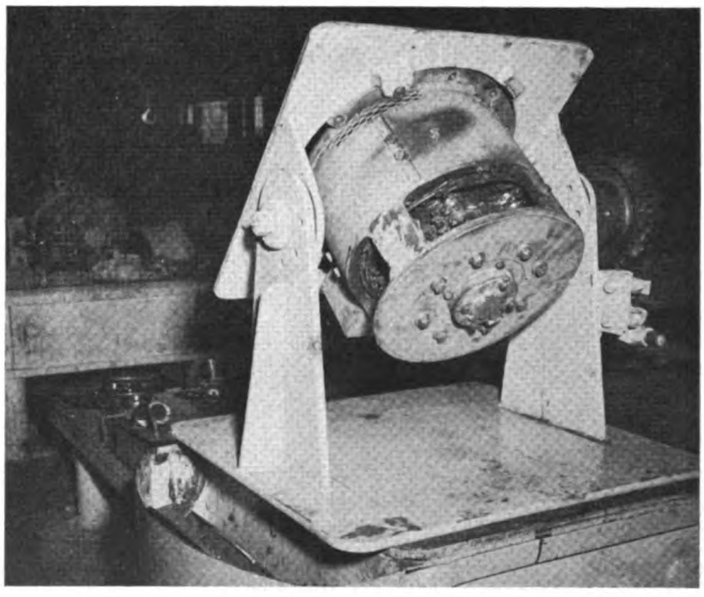
The panel is black micarta from stock. The toggle switches were salvaged from obsolete equipment. Repaired magnet coils of fuel oil shut-off valves from diesel units became the d-c relays. The electric clock was salvaged from retired equipment.

Acceptance tests are conducted in accordance with the National Bureau of Standards Circular 599. All sample flashlight batteries are given the heavy industrial flashlight test where each cell is discharged through a resistance of 4 ohms for 4-min. periods, beginning at 15-min. intervals, for 8 consecutive hours every day, with 16-hour rest periods intervening. (There are 32 such discharge periods each day or a total daily discharge of 128 minutes.)

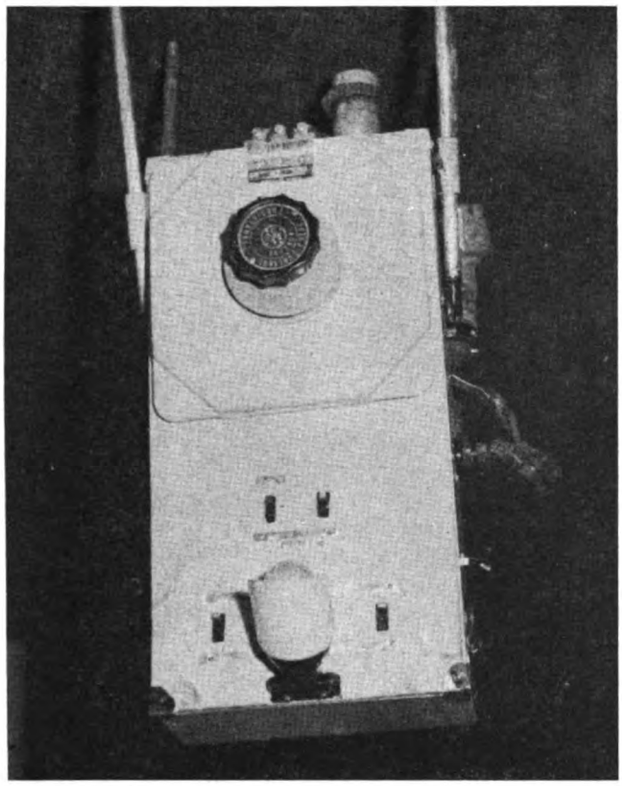
Daily readings are taken of the initial open circuit voltage of the cell, the initial closed voltage of the cell, and the closed circuit voltage of the cell at the end of the 16th and 32nd discharge periods. The test is continued until the closed circuit voltage of the cell falls below 0.90 volts. The service life is the total number of minutes of actual discharge to 0.90 volts.

All sample switchmen lantern batteries are tested in accordance with the Railroad Lantern Battery Test. The batteries are discharged every day during 8 periods of 30 minutes each, beginning at intervals of 1 hour for 8 consecutive hours, through a resistance of 8 ohms for each cell in series in the battery (usually 32 ohms required). Open and closed circuit voltages are taken as above except that the closed circuit voltage after the initial, is taken only once daily at the end of the last period of discharge for the day. The test is continued until the closed circuit voltage of the battery falls below 0.90 volts per cell. The service life is the total number of hours of actual discharge to 0.90 volts per cell in the battery (usually 3.6 volts for battery).





POSITIONER FOR AUXILIARY GENERATORS conceived and built in the Glenwood, Pa. shops of the Baltimore and Ohio.



The test panel is portable and may be used with either Alco-GE or EMD locomotive units.

Dynamic Brake Tester

■ A means of testing the operation of dynamic brakes on B locomotive units when no cab unit is available has been developed in the Baltimore & Ohio's Gleenwood, Pa., shops. It may be used on either Alco-G.E. or Electro-Motive units.

For making the test, the unit is operated from the hostler's control. The test panel is connected to the locomotive control circuits by standard plugs and receptacles and to the dynamic brake receptacle of either Alco-G.E. or E.M.D. units. Inside the test panel are the various switches and resistors necessary to complete the braking circuits as in a cab unit.

With the test panel in the locomotive, panel plugs are applied to locomotive receptacles. The locomotive is then started from the hostler's control, and almost immediately the panel operator throws panel switches to put the locomotive in dynamic braking. Braking effect is then observed by feeling the retardation of the unit and by observing the operation of the braking resistor cooling fan.

Easy In or Out For Propane Tanks

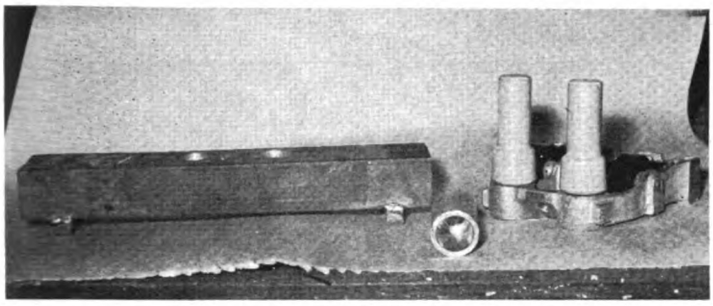
■ The two-wheeled truck shown in the illustrations eliminates all heavy work in placing or removing propane tanks from the fuel tank carrier under passenger cars. The tanks contain fuel for the operation of Waukesha ice engines and engine-generators used to supply air conditioning and the electric light and power to the car.

To pick up a tank from a storage platform, the truck is tipped up against the tank as shown in Fig. 1, so that the truck saddle rests against the side of the tank. The small lever between the two handles is then raised to lock the tank handle or grip securely to the truck.

The truck with the tank attached may then be tipped to the position shown in Fig. 2 and rolled to the car. The truck is of such a height that when it is in this position, the lower end of the tank may be pushed into the tank carrier under the car. Then it is only necessary for the operator to lift the locking handle and the tank slides into the carrier.

When the tank is empty, its weight is so reduced that it is a simple matter to slide it out of the carrier back onto the truck. The truck was developed on the Rock Island at El Reno, Oklahoma.

At left: The truck is tipped up and locked to the tank at the tank storage platform. Below: From this position the tank may be released to slide into carrier under car.



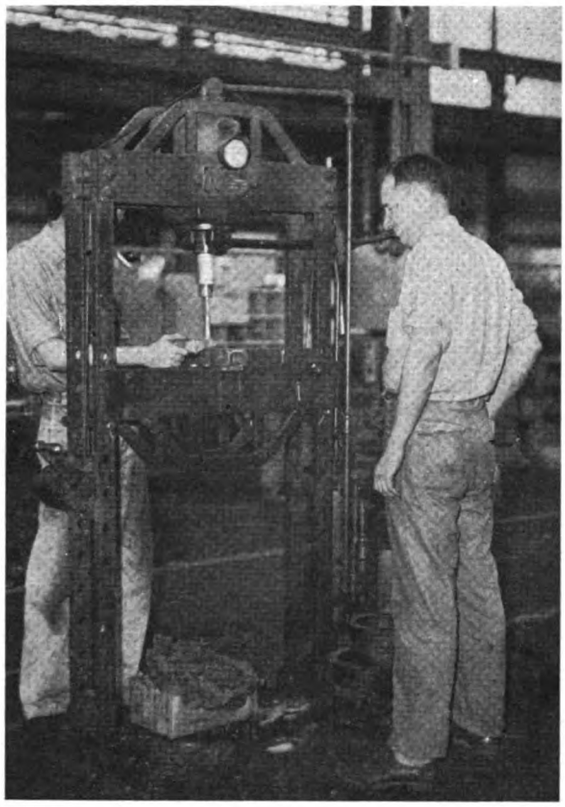
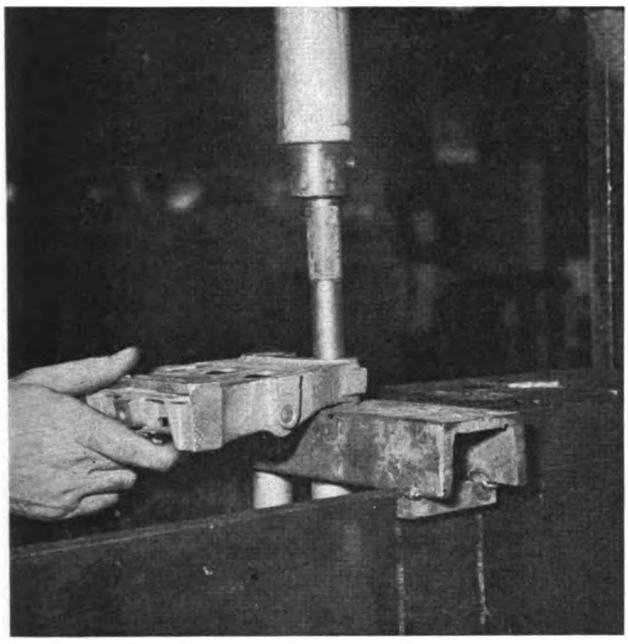


Fig. 1 (at right)—The man at the left manipulates the jigs while the man on the right applies pressure wth a hand pump.
Fig. 2 (above)—The jig at the left, the cup and a push pin, (not shown), are all the tools required to replace studs.
Fig. 3 (below)—An old stud comes out through one of the holes in the jig.



Replacing Brush Studs

As diesel traction motors come in to the Boston & Maine's North Billerica, Mass., shops, porcelain insulators are removed and replaced with molded type plastic insulators. This requires that the brush studs be taken out of the brush rigging and replaced. A hand-operated press and two jigs are used.

The press is shown in operation in Fig. 1. Jigs for doing the work are shown in Fig. 2. At the left is a channel, 3 in. wide and 2 in. high, having two 1⅜-in. holes in the top, spaced to correspond to the distance between studs in a brushholder. Next to the channel is a brass cup which makes a loose fit over a brush stud insulator and which is short enough so that the rim of the cup will not reach the insulator shoulder when it is placed over the insulator.

The first operation is shown in Fig. 3. Here a pin or push rod, half of which is smaller in diameter than the stud, is placed between the ram of the press and the bottom of a stud, while the brush holder rests on the jig with the studs projecting down through the two 1⅜-in. holes. As pressure is applied, the pin holding the stud is sheared and the stud is pushed out.

The replacing of a stud is shown in Fig. 4. Here the brush rigging is turned over on the channel, and the brass cup is placed over the insulator. Pressure on the cup forces the stud into the hole in the brush rigging without damage to the insulation. The final operation consists of drilling a hole through the side of the brush rigging and through the stud. A new pin is driven into this hole.

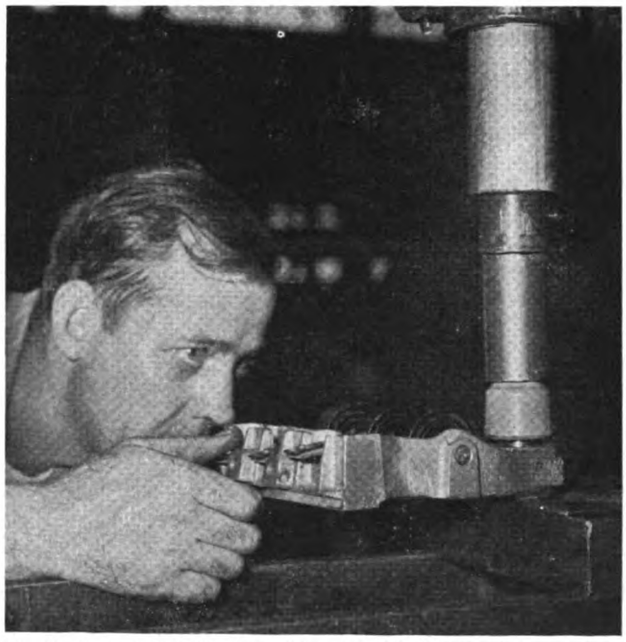


Fig. 4—A new stud goes into place with aid of brass cut or mandrel.

Studs are normally .002 in. larger than the hole in the brush rigging. When holes are worn, they are reamed and .031 in. oversize studs are used.

How a Slippery Rail Blew a Control Fuse

By Gordon Taylor

A two-unit E-7 passenger diesel was dispatched from its home maintenance point and operated perfectly to the next division point, 100 miles distant.

A few miles after leaving the division point, the wheel slip relay operated and the 30-amp control fuse in the lead unit was blown. The crew replaced the 30-amp fuse several times but it continued to blow each time the locomotive was started.

The crew called back to the division point by telephone and an electrician drove out to the locomotive with a new supply of fuses. He pulled various fuses, tested them and started replacing them. When he installed the fuse for the Mars headlight, the 30-amp control fuse blew immediately. He naturally associated the blowing of the control fuse with his application of the Mars headlight fuse so he removed the Mars headlight fuse, and since a new 30-amp control fuse then did not blow, he dispatched the locomotive on its way without a Mars headlight.

He then notified the electrician at the next maintenance point to meet the train with a supply of fuses, and called attention to the trouble with the Mars headlight.

In the meantime, the locomotive crew encountered more trouble with the 30-amp control fuses blowing, but by applying more fuses managed to reach the next maintenance point, where they were met by the electrician.

The electrician at the second division point received the story of the crew about blown fuses. He supplied new fuses and could find nothing wrong with the Mars headlight. He then tested the diesel units and found nothing to interfere with their operation.

However, when the locomotive again started out with its train, it did not move a hundred feet until it was again in trouble with wheel slip relay action and blown 30-amp control fuse.

At this point, a more intensive inspection was made and the jumper cable connecting the two units was disconnected, revealing some bad order contact pins in the receptacle at the rear of the lead unit.

One of the pins connecting with wire No. WS-10 had a portion of pin bent clear out at right angles, where it could contact other contact pins. There were also two other pins which did not line up perfectly to fit into the jumper cable plug, but they did not seem to be in a position to cause trouble as did the WS-10 contact pin.

These pins were straightened up as well as possible with pliers and the plug again connected to the receptacle. However, there was still a wheel slip relay alarm, until it was discovered that the wheel slip relay on the rear unit had its interlock contacts stuck together, having been burned and welded together.

These wheel slip relay contacts were opened and separated after which the locomotive resumed its run without further trouble. However, all division points were notified by telephone to not molest or tamper with the jumper cable at the bad order receptacle until permanent repairs could be made to the receptacle.

The jumper cable connecting the two units was disconnected.

On the locomotive's return trip, the wheel slip relays were repaired in the trailing unit and the bad order contact pins were replaced in the receptacle on the rear of the lead unit.

When the receptacle was repaired on the lead unit, it was discovered that a portion of the split pin No. WS-10 in the receptacle had bent in a position to touch contact pin N-4. In fact, pin No. N-4 was badly burned where a portion of pin No. *WS-10* had touched it.

If the control circuit is traced, starting with the 30-amp fuse, it will be seen that it passes through the control switch to the *PC* wire. The *PC* wire connects one side of the wheel slip relay contacts for the purpose of lighting the wheel slip light.

In this case, however, when the locomotive got on slippery rail and the wheel slip relay acted, it served to connect the *PC* wire to the *WS-10* wire. Since the split contact pin *WS-10* was touching the *N-4* wire, when the wheel slip action occurred, it connected the *PC* wire directly to the *N-4* wire and blew the control fuses.

As in many cases, the circuit was not maintained constantly but acted as a swinging contact, which made the trouble come and go in a manner difficult to locate.

At first it was difficult to see how the locomotive could

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

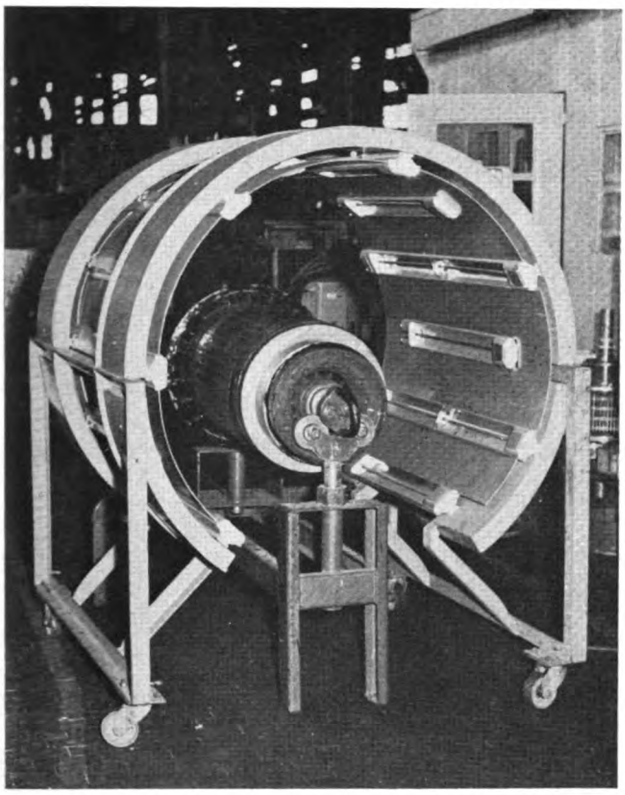
have moved at all with the receptacle in the condition described. However, the contacts were such that everything worked well as long as the locomotive wheels did not slip.

Since there was a lot of rain on the night in question, there were a number of spots where wheel slip conditions were favorable, and that is what occurred. So a slippery rail and bad order jumper cable receptacle caused a very bad series of delays.

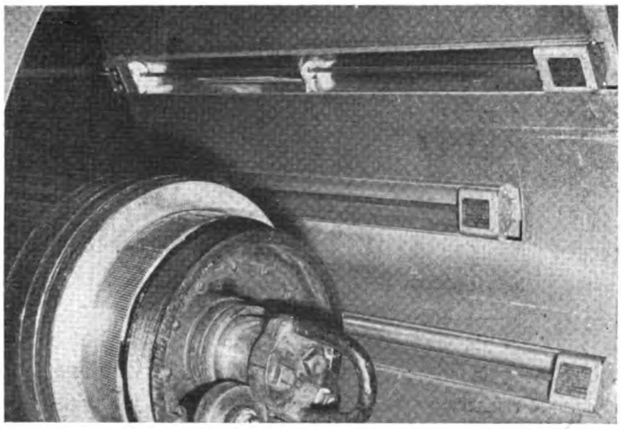
A flashlight should be used to examine the condition of contact pins in jumper cable receptacles to assure their being in good condition when the cables are applied.

Great care should be taken to line up the jumper cable with its guide slot in the receptacle before the cable plug is pushed into the receptacle.

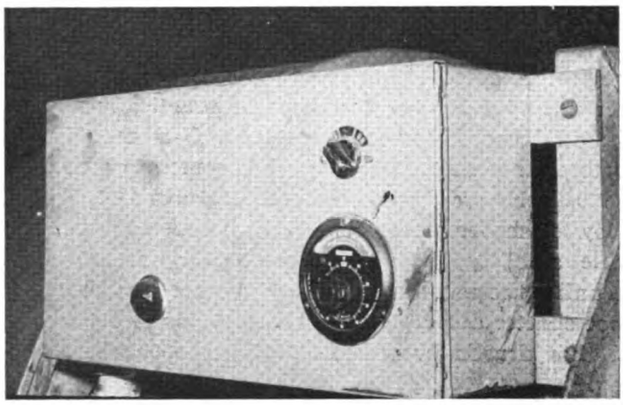
The Mars headlight fuses feeds off the light circuit and is not connected to the 30-amp control fuse. Many times one can be fooled by some action taking place at the time he is performing some operation that is not related to the trouble at hand.



The armature mounted on rollers is turned a few degrees periodically as its temperature is brought up.



Inside view of the heater showing the arrangement of heating units and reflectors.



At right: The time-cycle controller mounted on the outside of the heater.

Portable Infra Red Heater

A HEATING DRUM employing radiant heaters and polished metal reflectors for preheating electric parts including coils before applying them, for heating armatures prior to banding, for curing string bands, etc., is proving to be a useful tool in the Pt. St. Charles shops of the Canadian National at Montreal, Can.

A total of 14 kw. of Chromalux radiant heating elements are arranged inside the drum as shown in the illustrations. The polished metal reflectors which form the periphery of the drum so redirect heat toward the center that the outside of the drum is always cool enough to touch. The reflectors may be slid out from the ends for periodic repolishing.

The heating elements are controlled by a percentage timer operating on a one-minute cycle. Adjustment of the timer control knob serves to connect the heater to the power supply for any part of each minute as desired. Thus it may be on for 50 seconds and off 10, or on 40 seconds and off 20, etc., to produce the temperature required.

The maximum temperature obtainable on an armature is 250 deg F with no closing of the ends of the drum.

The overall height of the unit is 66 in., the inside diameter is 43 in. and the length is 47 in. which, experience has shown, may be reduced to 38 in.

The heater was designed and built under the direction of W. D. Piggott, assistant works manager, and K. E. Hunt, special engineer, both of the Canadian National.

3 Reasons why...

G.E.'s traction system gives you maximum locomotive performance

1—HIGHER CONTINUOUS TRACTIVE EFFORT

In day-to-day operations, locomotives equipped with G-E traction motors consistently prove their capacity for carrying heavier loads. That's because the GE-752 motor has 15 percent higher continuous tractive effort, at comparable gearings, than any other motor in railroad use. This extra capacity accounts in large measure for its record of low maintenance costs and low percentage of failures—two important factors in lowering operating costs.

2—FEWER LOCOMOTIVE ROAD FAILURES

Although flashovers occur on all locomotives, road failures due to generator flashover are practically unknown on locomotives equipped with G-E traction generators. In actual tests, one G-E generator took over 400 flashovers without failure. Features that assure low flashover damage include: inherently high machine stability; mycalex brush-holder insulators which unlike the porcelain insulators in other generators will not shatter during flashover; and, a brush-holder shield that drastically reduces damage to the brush rigging.

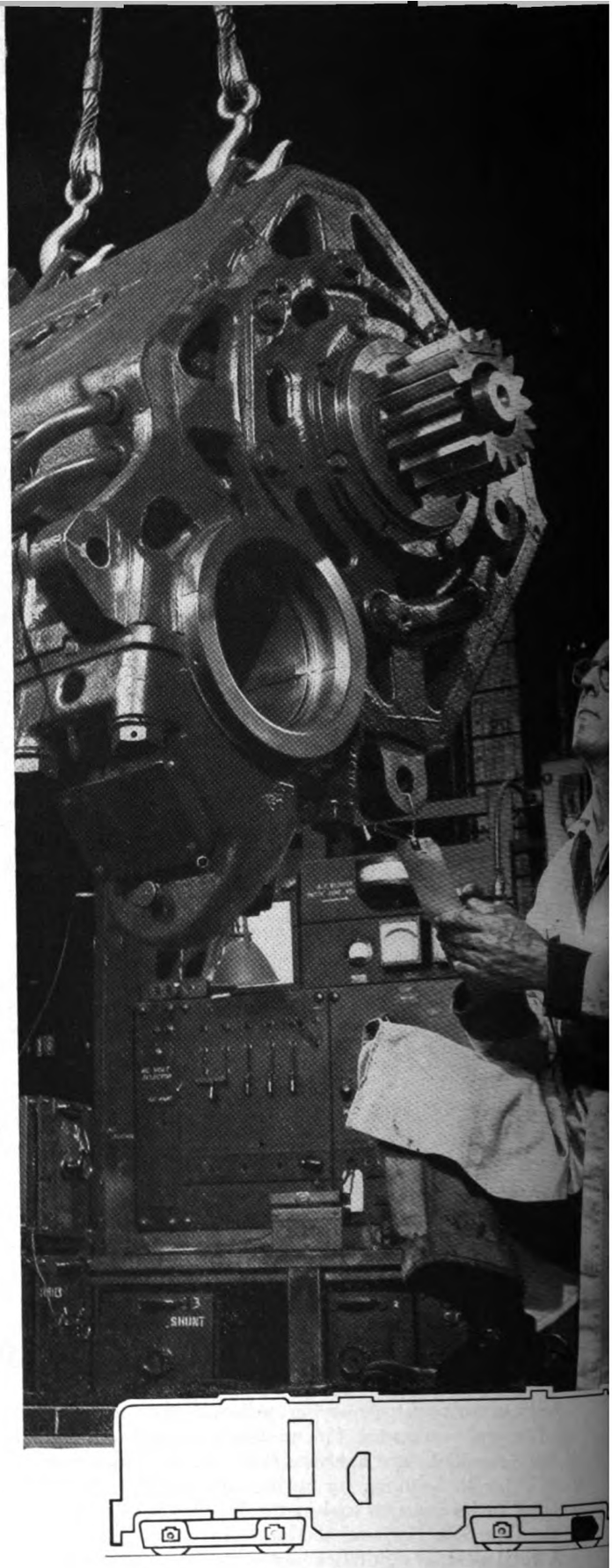
3—MINIMUM MAINTENANCE REQUIREMENTS

One of the chief benefits that any locomotive control system can provide is reliability. It is important to reduce or eliminate those small, continuing and aggravating maintenance problems that occur on some control systems. In actual tests, G-E control has operated hundreds of thousands of miles in heavy mainline service with complete reliability.

Ask your G-E Apparatus Sales representative for more information about the General Electric traction system —the system that sets the industry standard. Or write Section 115-8A, Locomotive and Car Equipment Department, Erie, Pa.

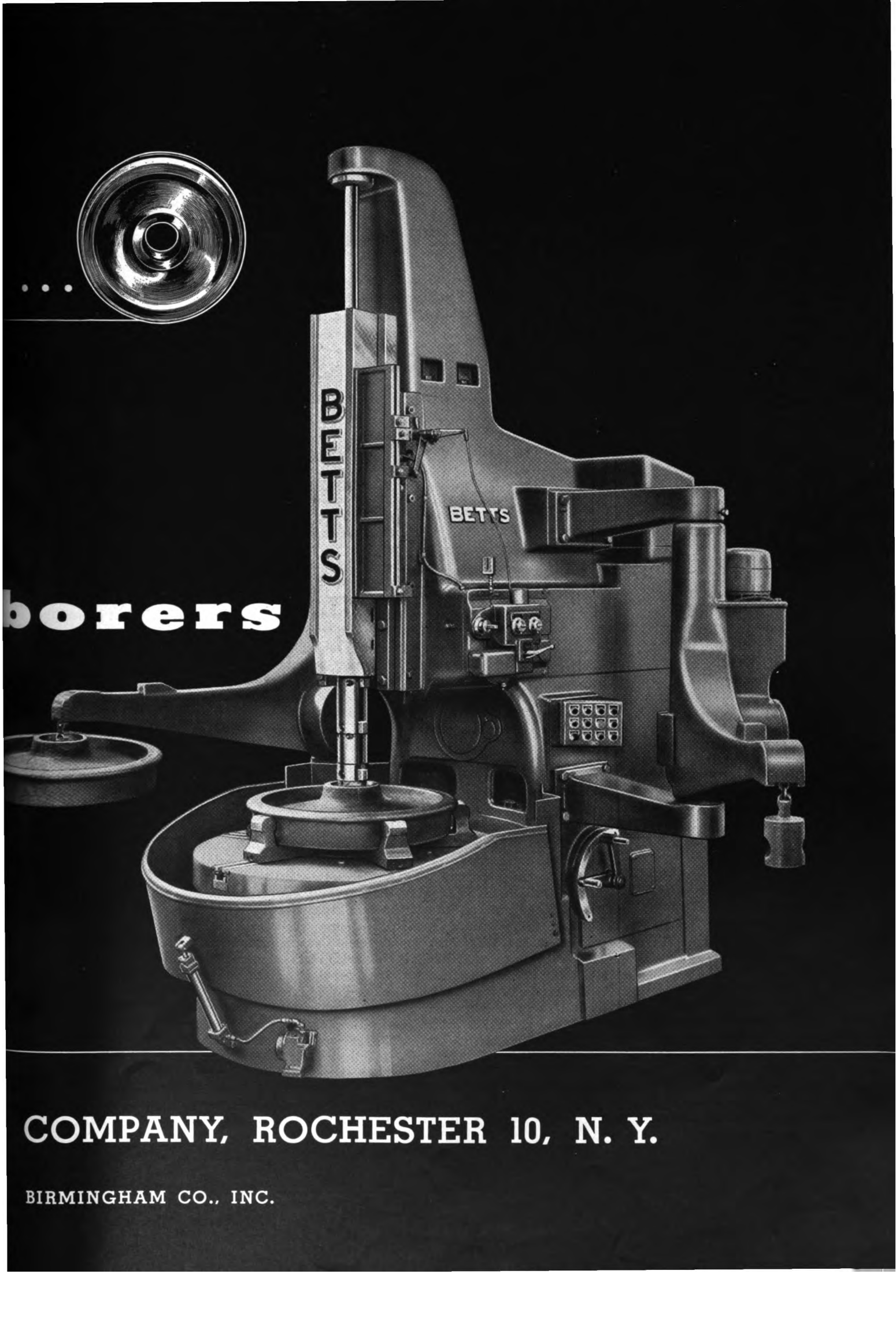
Progress Is Our Most Important Product

GENERAL ELECTRIC



1 G-E TRACTION MOTORS GIVE YOU 15% HIGHER CONTINUOUS TRACTIVE EFFORT

More working material in the GE-752 motor (12 perc heavier than any other motor offered for stand application) means higher ratings. The effective use additional active copper and iron results in the m powerful traction motor available today.



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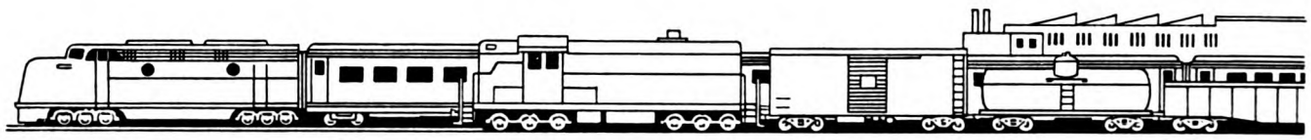
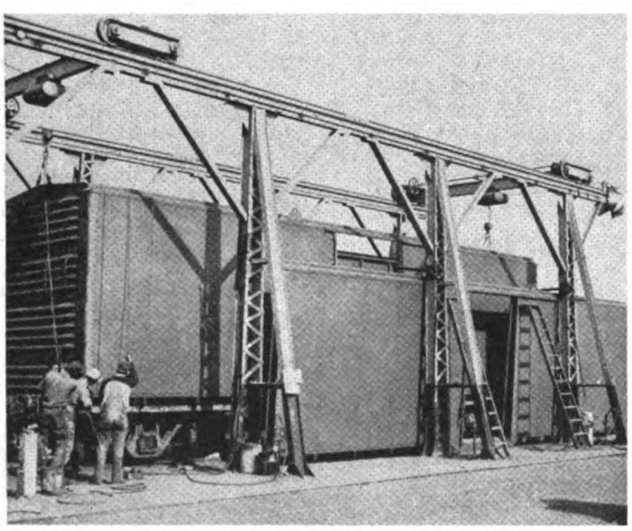


A NEW PROBLEM this month. If your experience or ideas can help with this topic, remember that it pays you to submit them to the Q&A Editor.

• *What can be done to eliminate the moisture contained in the compressed air delivered to the bell ringers and sand traps of diesel locomotives, or what can be done to prevent failures of these devices that are caused by this moisture.*

Rebuilding Freight Cars

For ordinary heavy freight car repairs, does it save time and money to assemble car sides or sections of car sides in a jig prior to their application to the car?



Extensive use is made of jigs for producing sub-assemblies for new cars. Box cars on this railroad-owned production are being built with them.

A GREAT TIME SAVER, *by R. Schey, general superintendent car department, Nickel Plate Road, Cleveland, Ohio.* On our railroad we find that it is a great time saver to assemble car sides for hopper and gondola cars in a jig prior to their application to the car. In fact, for hopper cars we also assemble entire sections with cross hoods and inside and outside hopper sheets. A crane sets these assemblies directly on the car underframe. Two benefits are derived from this—a faster operation and a more accurate fit. An accurate fit is not always possible when individual pieces are laid in place on the underframe.

Up to the present time we have not been confronted with complete car sides for box cars. Should this develop in the future, we would also assemble box car sides in jigs for application to the underframe and ends. This would be done rather than laying up the posts and sheets individually.

Waterproofing Diesel Electrics

Can diesel electric locomotive interiors be waterproofed so they can be spray cleaned without damaging the electrical equipment?

DON'T BE AFRAID TO SPRAY THEM, *by C. W. Martin, assistant engineer—diesel electric, Baltimore & Ohio, Baltimore.* Diesel electric units can be protected from moisture, but why "waterproof" the locomotive interiors? If the electrical apparatus is kept clean and coils are painted with a good grade of insulating paint, the only troublesome spot that I know of is the grid resistors that are insulated with mica washers and mica tubes. A good coat of red glyptal or the equivalent to seal the mica from moisture absorption will protect this spot. Heresy, undoubtedly, for those who have never tried it.

I have personal knowledge of a diesel maintenance shop where the following was daily procedure for a number of years. The locomotives involved were four unit model FT's, as vulnerable units for such treatment as has seen service on American railroads. Immediately prior to dispatchment after all mechanical and electrical work was completed, the locomotive was placed outside the diesel shop. Two laborers, each equipped with a steam cleaning gun, started at one end of the locomotive and sprayed everything inside the engine room except inside the main generator and inside the electric lockers. One laborer worked down each aisle of the unit. Saturated steam at 100 psi, the wetter the better, propelled a detergent against the engine, ceiling sheets, side walls, generator pits, generator housing, outside of electric lockers, etc.

The engine room immediately filled with vapor to such an extent that the laborers worked by feel and intimate knowledge of the unit rather than by sight. Vapor fog prevented sight of other than general outlines. In twenty minutes the interior of four units had been sprayed. Immediately the two spray gun operators, assisted by a third laborer, who had helped handle the hose lines and the detergent barrels, picked up the water and the dirt from the unit floors, generator pits and around compressors with cotton mops and mop buckets. In another fifteen to twenty minutes the floors and pits had been mopped and the locomotive was leaving the ready track. On "short calls" the locomotive frequently departed from

(Continued on page 84)

Questions and Answers

6-SL Brake Equipment

This is a new series of Questions and Answers pertaining to the 6-SL air brake equipment for switching locomotives. The references to the pamphlet, page and part numbers in the text indicates where the original material may be found in the manufacturer's technical publications and instruction pamphlets. Authorized persons may obtain a copy of Instruction Pamphlet Number 5046-15 which deals with this equipment by applying to the nearest district office of the Westinghouse Air Brake Company.

W1-Q—For what service was the No. 6-SL brake equipment designed?

A—This equipment was designed to adapt standard devices for use on Diesel-Electric and other electrically driven switching locomotives.

W2-Q—What is the purpose of the basic 6-SL brake equipment and how does it compare with former 6 ET and 14 ETL single-end equipments?

A—The basic 6-SL equipment was designed to provide single end, single unit automatic brake operation. It has all the operating features of the brakes previously mentioned and in addition it has a self-lapping independent brake valve.

(Pamphlet 5046-15 Page 5)

W3-Q—What limits the speed of response when the independent brake valve handle is moved?

A—Promptness of response is limited only by the capacity of the 6-KR distributing valve to handle the volume of the brake cylinders.

Description of Parts

(Pamphlet 5046-15 PPages 6-7-8)

W4-Q—What are the parts of the basic 6-SL equipment?

A—Air compressor and governor, main reservoirs with coolers, automatic drain valves and safety valves. Brake valve pedestal, equalizing reservoir, distributing valve, air gauges, emergency brake valve, filters, dirt collectors, brake cylinders, dead engine fixtures, emergency relay valve, KM vent valve and various cut-out cocks, hoses and couplings, dummy couplings, etc.

W5-Q—What type of air compressor is used with this equipment?

A—A Type 3-CD motor driven compressor.

W6-Q—What type of compressor governor is used?

A—The S-16 Compressor Governor—the automatic double safety valve type.

W7-Q—What is the function of the main reservoirs?

A—As with all equipment, the two main reservoirs are used to store and cool the compressed air furnished by the air compressor. They also accumulate moisture, oil or other foreign matter, and allow clean, dry air to pass to the brake system.

After Cooler

W8-Q—What type After Cooler is used with this equipment?

A—The A-2 After Cooler (Fig. 3) is used for the purpose of cooling main reservoir air.

W9-Q—Where is the after cooler located?

A—In the pipe between the first and second main reservoirs (Plate 10).

W10-Q—What does the after cooler consist of?

A—It consists of two headers (Fig. 3), between which are eight finned copper tubes.

(Pamphlet 5046-15 Page 9)

W11-Q—What is the cooling effect of this type of after cooler equivalent to?

A—Approximately 100 feet of 1¼ iron pipe.

W12-Q—Describe the A-2 after cooler further.

A—The finned tubes are connected in parallel to the headers by means of Wabcotite fittings with special packing cups to seal the joints against leakage.

W13-Q—What insures uniform distribution of air flow through the tubes?

A—The inlet header is provided with throttling devices designed to insure uniform distribution of air flow.

W14-Q—How are the pipes connected to the after cooler?

A—The pipe connections, inlet at top of one header and outlet at bottom of the other, are provided with flanged pads for Wabcotite fittings.

Automatic Drain Valve—Plate 10

W15-Q—Where are the automatic drain valves located and what is their function?

A—One, located on the first main reservoir, drains moisture from that reservoir. Another, located in the pipe between the after cooler and second main reservoir, discharges the moisture from after cooler with each operating cycle of the compressor governor and FA-4 magnet valve.

W16-Q—What does the automatic drain valve consist of?

A—The automatic drain valve, Fig. 4, consists of a body (2), containing ball check (5); valve seat (6); upper valve stem (3); valve spring (4); lower valve stem (17); diaphragm (9); diaphragm follower (8), and diaphragm spring (7).

W17-Q—What chambers are connected to the body and what do they contain?

A—Sump chamber (28), incorporating a strainer and check valve (29), bolts to the top of the body, and a swirl chamber (32) and, bolts to the top of the sump.

W18-Q—Describe the pipe connections to the automatic drain valve.

A—The two fittings (35) and (39) which connect the drain valve to the main reservoir pipe are bolted to the swirl chamber. A flange (12), provides for the pipe connections to the FA-4 magnet valve and the drain opening is tapped for ¼-in. pipe.

W19-Q—Describe the normal position of the parts of the automatic drain valve.

A—The automatic drain valve is shown in its proper position in Fig. 4, when diaphragm (9) is inclined, and the drain port is at the lower edge of the diaphragm. thus preventing an accumulation of water on the diaphragm.

W20-Q—Is there any discharge of main reservoir air at this time?

A—No. Spring (4) holds upper stem (3) and ball (5) in the lower position in which the ball is seated on valve seat (6), so that the lower opening past the ball check is normally closed, preventing any discharge of air. Spring (7) holds diaphragm follower (8) and lower valve stem away from contact with the lower side of ball check (5) when there is no air pressure under diaphragm (9).

W21-Q—What happens as the air compressor operates?

A—As the air compressor operates and moisture is precipitated, it is collected in the sump (29) and the drain chamber above the ball check valve.

W22-Q—What action takes place when the compressor governor functions to cut off power to the compressor and magnet valve?

A—Air flows through the magnet valve to the under side of the diaphragm, deflecting it upward, causing diaphragm follower (8) and lower stem (17) to move the ball check from the lower to the upper seat.

W23-Q—What takes place during the movement of the ball valve?

A—A passage is provided from the drain chamber and sump chamber to atmosphere which permits main reservoir air to quickly discharge accumulated water from the drain chamber.

W24-Q—What happens when this movement is completed?

A—The ball valve is held to its seat by air pressure under the diaphragm, preventing further discharge of water and air.

W25-Q—What action takes place when the governor functions to cut in power to the compressor and magnet valve?

A—The magnet valve vents the air from the underside of the diaphragm and its spring (7) moves the follower (8) and diaphragm downward so that the lower valve stem (17) breaks contact with the ball check; main reservoir air and valve spring (4) move upper valve stem (3) and ball check (5) downward so that the ball check is seated on lower valve seat (6).

W26-Q—What is the result of this operation?

A—The operation again discharges a definite amount of water as explained for the upward movement of the ball check.

General Motors
Diesel-Electric Locomotives

This is a new series of Questions and Answers pertaining to General Motors diesel-electric locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

Dynamic Braking

(Manual 2310, pages 317, 319)

G356-Q—Describe the action for completion of the field loop circuit.

A—By moving the transition lever from the OFF to the B position, a contact in the controller energizes the BG wire throughout the locomotive. Taps from this wire energize the battery field contactors in each unit, thereby completing the field loop circuit.

G357-Q—How does this affect the battery field on each unit?

A—The battery fields of all generators are now in series and are energized from the operating "A" unit.

G358-Q—What assurance does the field loop connection give?

A—This series connection (the field loop) assures that each main generator is excited with the same amount of current.

G359-Q—What controls field loop current?

A—The field loop current is controlled by the movement of the transition lever in the dynamic braking range. The lever operates a variable resistance in this circuit.

G360-Q—Why is the output of each main generator identical?

A—Since the speed of each engine is held at Idle (275 RPM) and each main generator has the same exciting current, the output of each main generator is identical. The excitation of the traction motors in each unit is the same.

G361-Q—How is equal braking on each unit assured?

A—Because all units of the locomotive generally have the same gear ratio. the traction motors will be turning at the same speed. The braking effort of each "motor" will be the same.

G362-Q—What is the function of the unit selector switch?

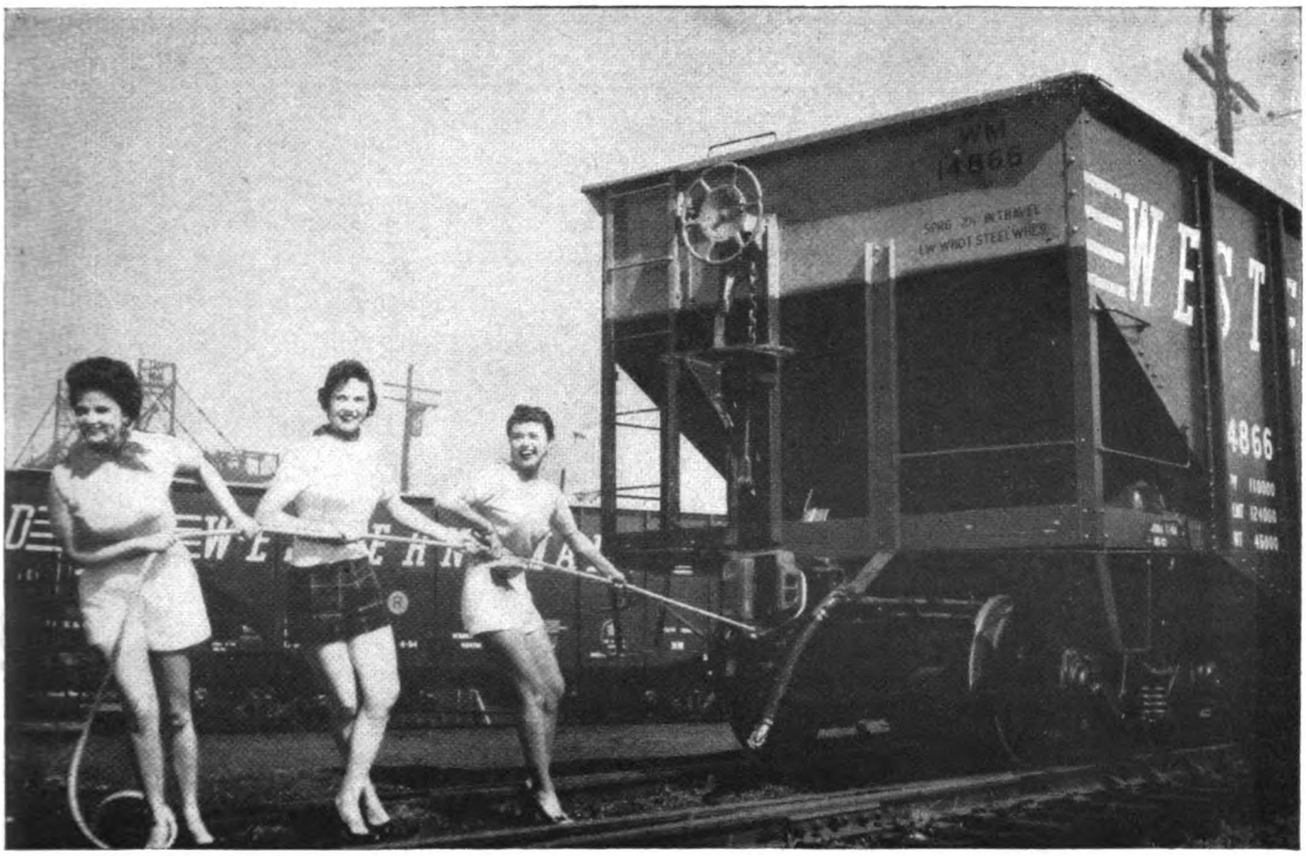
A—To provide the same resistance in the field loop circuit regardless of the number of units in the consist.

G363-Q—Does it make any difference if a unit is isolated?

A—No. The main generator field of that unit is still in the field loop circuit, and if one unit is isolated, the unit selector switch is not changed.

G364-Q—What is the set-up in the event that the last unit is a "B" unit?

A—A shorting bar at the back of the receptacle cover will close the field loop when the dynamic brake jumper is removed from the receptacle in the trailing end of that unit.



Friction no problem when Timken tapered roller bearings carry the load. No freight cars set out between terminals . . . no car-days lost. And you cut terminal inspection man-hours 90%. Shippers gain delay-free, on-time deliveries. So provide more dependable service, make less demand on power, with bearings produced by The Timken Roller Bearing Company, Canton 6, Ohio.

The Timken Company uses steel containing nickel in bearings for "Roller Freight" cars

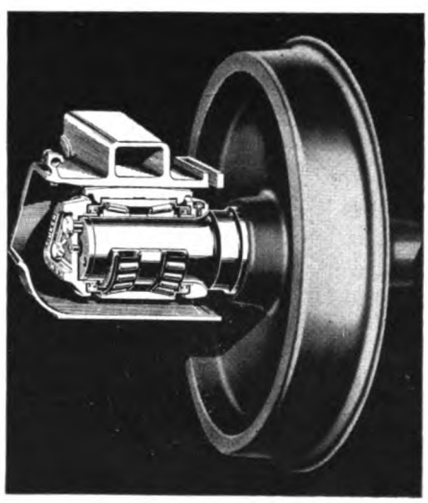
THESE GIRLS ARE ACTUALLY PULLING the car. In fact, frictional drag virtually disappears when a load rides on Timken tapered roller bearings.

They roll the load instead of sliding it.

No sliding, no hot box problem. There's just not enough friction. Axles turn on rollers and races of Timken's own special steel fortified with nickel. The addition of nickel makes possible high hardness plus extreme toughness. Accordingly, Timken tapered roller bearings with their positive roller alignment prove well able to carry lateral thrust. And, to save money hauling freight.

* * *

When you face questions about metal, let us give you the benefit of our wide practical experience. Write for List A of available publications. It includes a simple form that makes it easy for you to outline your problem.



Cutaway view shows simplicity of Timken bearing design . . a sealed roller bearing unit that requires no lubrication for years. Special nickel-rich steel makes races and rollers extra tough.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N.Y.

G365-Q—What happens if the trailing unit is an "A" unit?
A—The field loop contactor in that unit remains de-energized and in this position closes the field loop circuit.

Dynamic Brake Warning Relay

G366-Q—What is this relay?
A—A voltage operated relay connected in parallel with the No. 4 grid in all units equipped with Dynamic Brake.

G367-Q—When does this relay close?
A—This relay is set to close when the amperage through the grid reaches approximately 600 amperes.

G368-Q—How is this amperage determined?
A—By the voltage applied to the grid.

Fairbanks-Morse
Diesel-Electric Locomotives

This series of Questions and Answers pertains to Fairbanks-Morse diesel-electric locomotives. The references to manual and page numbers indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

F347-Q—What is the duty of the Forward and Reverse Sanding Magnet Valve?
A—To control forward and reverse sanding.

F348-Q—How are these magnet valves energized?
A—By sanding Pressure Switch through reverser interlocks.

(Bulletin 1706, 132A, Page 7)

F349-Q—How do the Engine Starting Contactors function?
A—To connect main generator to battery for starting the engine.

F350-Q—How are they energized?
A—From the Isolator through the Exciter Field Contactor (EF open interlock).

F351-Q—What is accomplished by the Generator Field Breaker?
A—Energizes propulsion control circuits from throttle.

F352-Q—What is the purpose of the Generator Field Contactor?
A—Limits generator field current during dynamic braking. Normally closed except in dynamic braking.

(Bulletin 1706, Section 132A, page 7)

F353-Q—How does the Ground Relay (GR) function?
A—The Ground Relay, which has a remote reset button on engine control panel, is energized in event of a ground in the main power circuit.

F354-Q—What are the indications if a ground occurs?
A—Alarm bells ring in all units and white lights are lit on engine control panel of unit affected.

F355-Q—What action takes place if the relay trips when motoring?
A—De-energizes T.V. (throttle contactor) to bring engine speed to idle and de-energizes exciter field contactor (EF) to remove power.

F356-Q—What happens if relay trips while throttle is in 5th or 6th position?
A—The Governor Solenoid (DV) shuts engine down.

F357-Q—What happens if the ground delay trips during Dynamic Braking?
A—Power Contactor (P-1) is de-energized to drop braking on unit affected. TV is de-energized to bring engine to idle.

F358-Q—What is the purpose of the Generator Surge Relay (GSR)?
A—This relay is so designed to energize in the event of a main generator flash over.

? ? ? ? ?

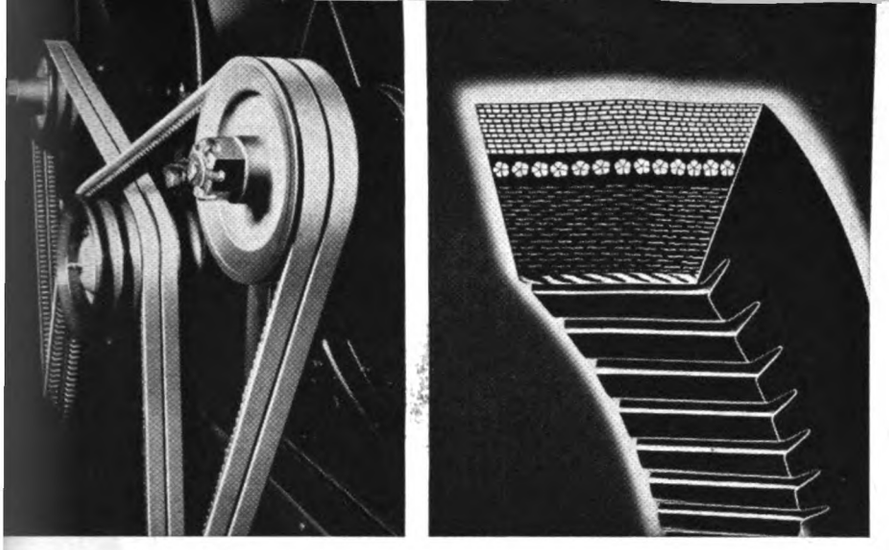
(Continued from page 80)

the ready track immediately after the spraying was completed, and the mop-up was accomplished enroute to the transportation yard. During spraying the diesel engines turned over at fourth notch engine speed.

When the three laborers climbed down from the engine room, average thirty minutes and maximum forty minutes after beginning to clean the four engine rooms, they were clean enough to pass the inspection of the most fastidious ICC inspector or railroad officer. Each locomotive in the pool received this thirty minute treatment every three days. This was the only cleaning necessary to dispatch clean engine rooms and these FT units had as many oil leaks inbound as anyone's locomotives.

This program can be accomplished by anyone with a little basic knowledge of a diesel electric unit and a desire for clean engine rooms. Locomotives in this pool handled heavy high speed merchandise trains, operated at full throttle over the major portion of an 1,150 mile run, were equipped with dynamic brakes and did not experience any ground relay or control ground defects after the cleaning program was inaugurated that could be traced to spray cleaning. In fact, defects due to ground leakage were practically unknown. Both control and power wiring of the above units was varnish cambric insulated.

With this experience behind us, wonder why on today's locomotive units with RH rubber neoprene conductors and duct enclosures which are not tight but are sloped to drain and are open enough to breathe, anyone would want to "waterproof." Electrical cleanliness will make modern equipment like a duck's back—the water will run off. An additional thought is that clean water will conduct very little current at the potentials involved in locomotive use.



Dayton Endless Cog-Belts provide tremendous gripping power, have great tensile strength, amazing flexibility lengthwise and are heat and oil resistant.

Dayton Endless Cog-Belts*

Seaboard Airline reduces diesel and air conditioning drive replacement costs 50% by switching to Dayton Endless Cogs.

It all started when the Seaboard Airline Railroad called in Dayton Field Engineers to find a means of improving drive performance. A change-over to Dayton Endless Cog-Belts—stronger by over 40% than standard V-Belts—was recommended and the change was made.

Belt failures became few and far between . . . the need for maintenance and service dwindled to an all-time low . . . savings in time and labor grew to important amounts . . . replacement V-Belt costs dropped to *half* of that expended in previous years when other drives were used.

Now Seaboard Airline uses Dayton V-Belts and Cog-Belts exclusively for all diesel and air-conditioning drives as well as for all special applications.

Savings like these, experienced by almost every railroad in the country (Dayton V-Belts are original equipment on over 90% of all types of diesels) are available to your railroad, too. Why not write Dayton Rubber Co., Railway Division, Dayton 1, Ohio, and learn how you can improve performance, lower costs with Dayton V-Belts for every drive requirement.

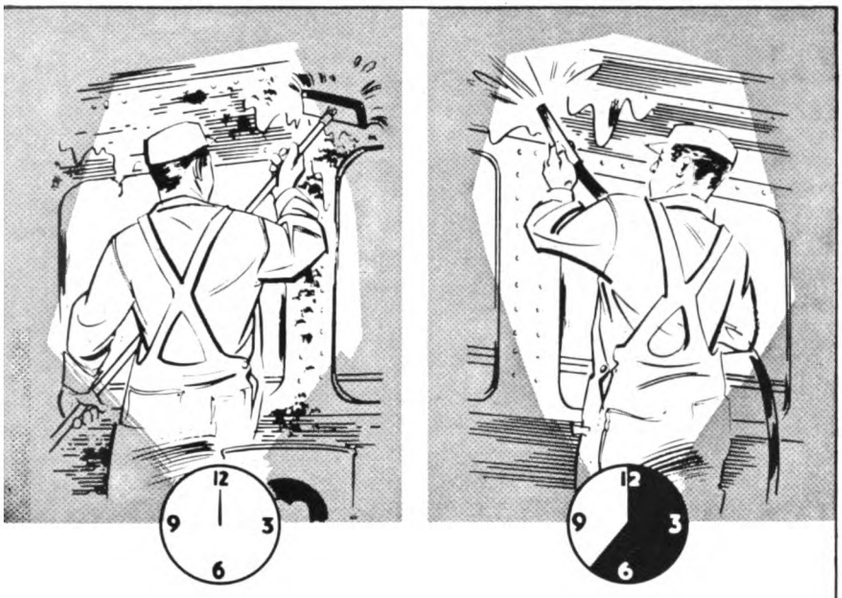
© D. R. 1955

GOLDEN JUBILEE
Dayton Rubber
50 YEARS OF PROGRESS

*T. M.

World's Largest Manufacturer of V-Belts

Specialized Railroad Representatives in New York, Chicago, Cleveland, St. Louis and San Francisco



Superintendent* Tells About Stripping Railroad Cars

"In stripping the many coats of heavy red enamel from cars, we had tried many kinds of paint removers without success. They were all slow acting, high cost strippers that had poor penetrating effectiveness and in many cases required several applications to get any sort of results.

Then I tried Magnus Stripit! From the 3 to 5 days required for the others, Stripit took less than 8 hours. Cars which had less heavy coats of paint took less than one hour. Overall, with Stripit, it has taken fewer man-hours to do a better, more thorough job of preparing cars for refinishing."

Prove to yourself the effective action of Stripit. Try it for 30 days . . . if you're not satisfied that Stripit does a better job—return the unused portion for complete cancellation of the invoice.

Write to Magnus at 77 South Avenue, Garwood, N. J., for this trial offer.

*Superintendent of cars for large Eastern Railroad

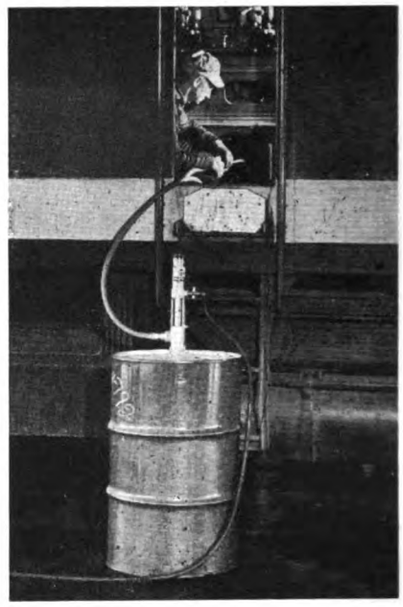
magnus

RAILROAD DIVISION

MAGNUS CHEMICAL CO., INC.

NEW DEVICES

(Continued from page 23)



Railway Drum Pumps

Designed for volume fluid handling requirements in filling diesel engine crankcases, emptying diesel engine crankcases, pre-charging diesel engine oil lines after overhaul and transfer of oils, antifreeze and other fluids.

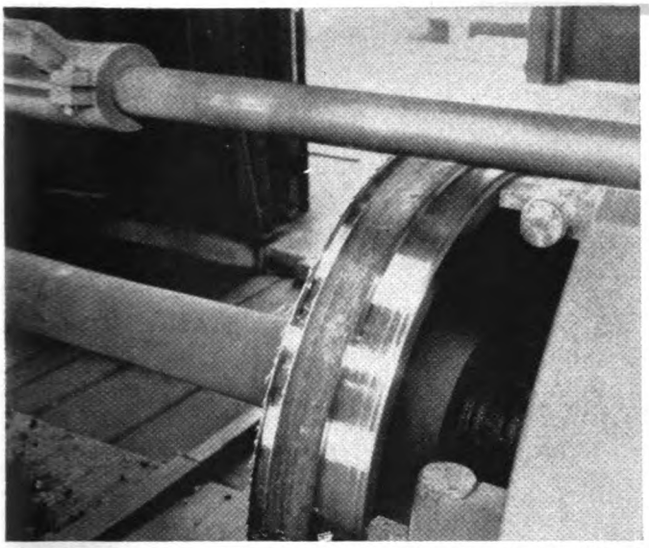
The outfit pumps direct from original containers and operates in all drums with 2 in. bung opening or open head drum. It is light in weight, only 13½ lb, and can be easily switched from an empty to a full drum. Its high volume pump will handle 18 gal per min of SAE 20 motor oil. Air-operated, the unit functions on air pressures of 35 to 200 psi. *Graco Railway Department, Gray Company, Inc., Graco Square, Minneapolis 13.*

Self-Sticking Numbers and Letters

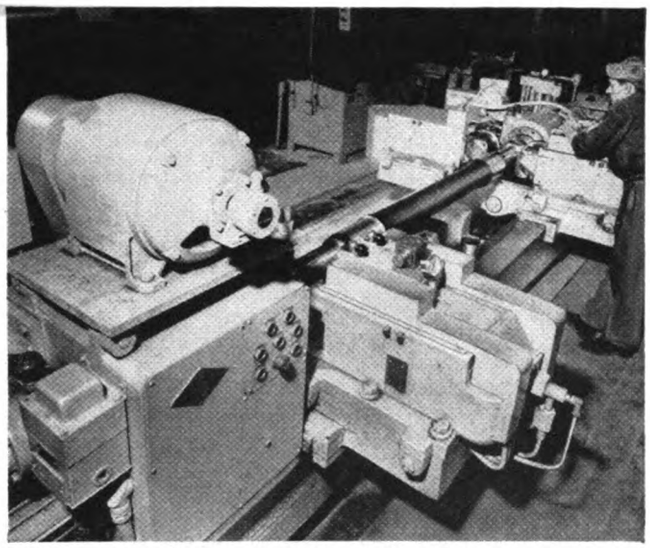
These numbers and letters are made of impregnated cotton cloth with a temperature-resistant pressure-sensitive adhesive. They come mounted on a dispenser card which protects the adhesive until used, and are available in six sizes, ½, ¾, 1½, 2¼, 3½, and 5 in. in height; the alphabet and numbers 0 through 9, and dashes.

The product provides a low-cost method of marking bays, bins, columns, shipping containers, machines and other equipment. The manufacturer states that tools, brushes, inks, metal stamps, etc., are done away with this identification system. *W. H. Brady Company, 727 West Glendale street, Milwaukee 12.*

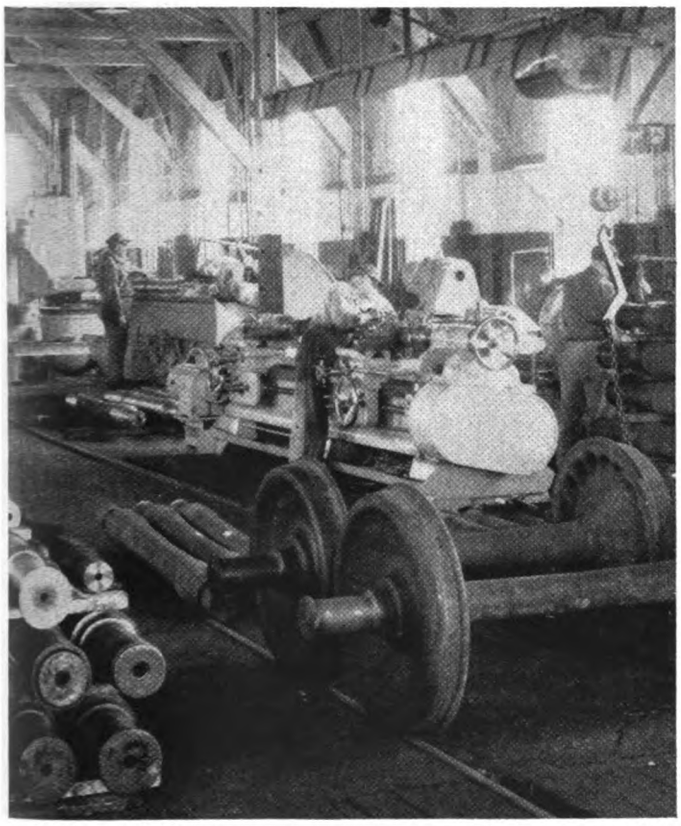
(Turn to page 98)



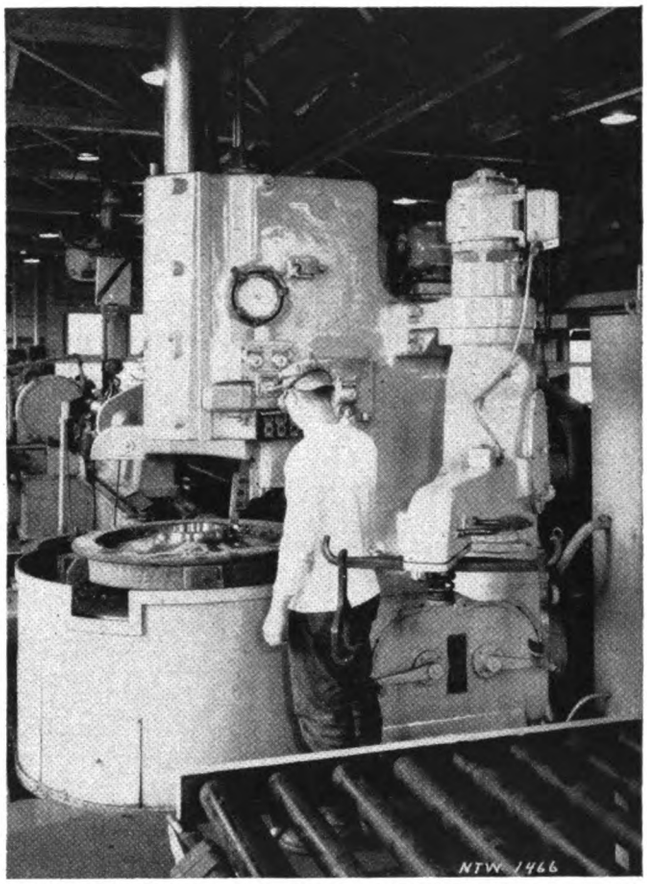
CLOSE-UP of the turret on the Niles 52" Hydraulic Car Wheel Lathe profiling and flanging tools in simultaneous operation. This Ivorydale installation was the first equipped with hydraulic feed traverse and contour profiling.



NILES HYDRAULIC BURNISHING LATHE Glenwood (Pittsburgh) Shops is saving at the rate of 1,000 man hours for the first year and its fully automatic operation does better work uniformly.



SHOP SCENE at Ivorydale shows four of their modern Niles Railroad Tools in operation . . . Left Rear: Niles 52" Car Wheel Lathe; Right Rear: Niles 48" Wheel Borer at work; Right Center; Two Niles Center Drive Axle Lathes. Foreground: Stocks of axles and wheel sets before operations.

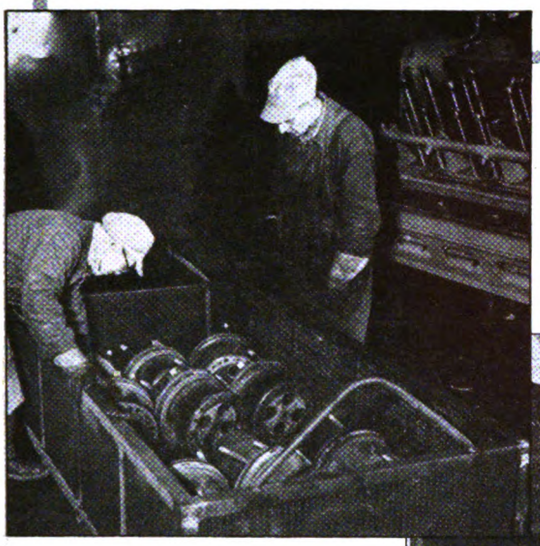


NILES 48" HYDRAULIC WHEEL BORER hub facing and hub turning at the Ivorydale B&O Railroad Shops.

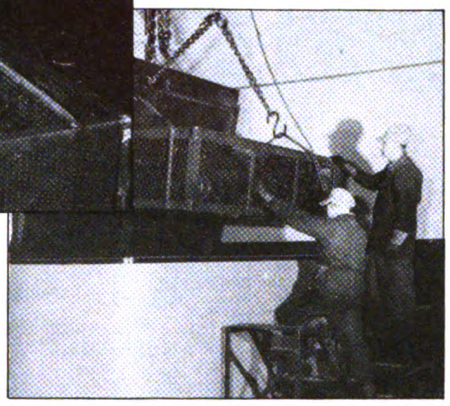
BALDWIN-LIMA-HAMILTON

Hamilton Division • Hamilton, Ohio

Tough Parts Cleaned Faster in LIX



Workman inspecting Diesel cylinder heads after cleaning with Lix Diesel Klean Heavy.



The Wabash Shops at Decatur, Illinois, get fast, thorough cleaning of diesel engine parts with Lix Diesel Klean Heavy.

WHY NOT LET LIX HELP YOU WITH YOUR TOUGH CLEANING JOBS?

All working parts of Diesel Locomotives, such as Pistons, Liners, Bearings, Lube Oil Coolers, etc., that are sometimes real problems, are cleaned faster and more thoroughly with Lix. Time and hard labor is reduced to a minimum.

No brushing or scraping is necessary. Just soak the parts in Lix and rinse with water or mineral spirits. It is harmless to all types of metals during their cleaning cycle.

A Lix representative will be glad to demonstrate in your shop how he can save you time and money.

Manufacturers of Lix Diesel Klean Heavy and Lix Electric Equipment Cleaner

Write, Wire or Phone today for free demonstration in your shop.

THE Lix CORPORATION
(OF MISSOURI)
PRODUCTS OF RESEARCH
716 EAST 85th STREET, Dept. RL-12
KANSAS CITY, MISSOURI

"Leadership in Industrial Cleaning"

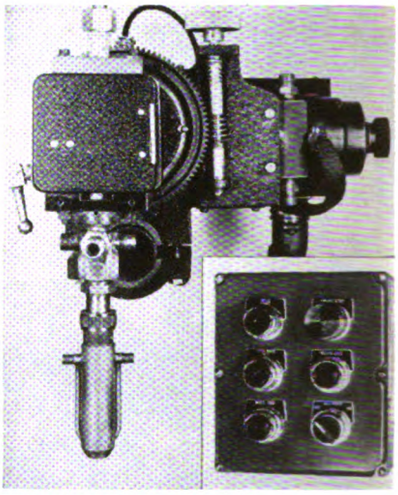
NEW DEVICES

(Continued from page 94)

Motor Alternator Voltage-Frequency Control

Type VF controls are made up of compact, integrated single packages for precise regulation of both voltage and frequency of motor-alternator sets and inverters. Model VF-60 is for 60 cycle outputs and Model VF-400 for 400 cycle outputs. The control permits conversion from any d-c source voltage to any a-c output voltage, within ratings of the controlled machine.

Standard units control both output voltage and frequency to within plus or minus 2 per cent. Models for control within plus or minus ¼ per cent also are available. *Electric Regulator Corporation, 314 Pearl street, Norwalk, Conn.*



Automatic Welding Head

This unit is designed for automatic welding applications employing the Aircomatic process, or inert gas consumable electrode method. Argon, carbon dioxide and helium shielding gases and all types of welding wires, either steel, aluminum, bronzes, stainless and Strandalloy, from 0.030 in. in diameter and up, can be used.

The device utilizes a single motor drive which has been made possible by advances in the welding process and development of a constant potential power supply. Simplified controls are said to offer definite advantages over previous models. The compact head has a continuous current rating of 600 amp. *Air Reduction Sales Company, Division of Air Reduction Company, 60 East 42 street, New York 17.*

Torque-Limiting Wrenches

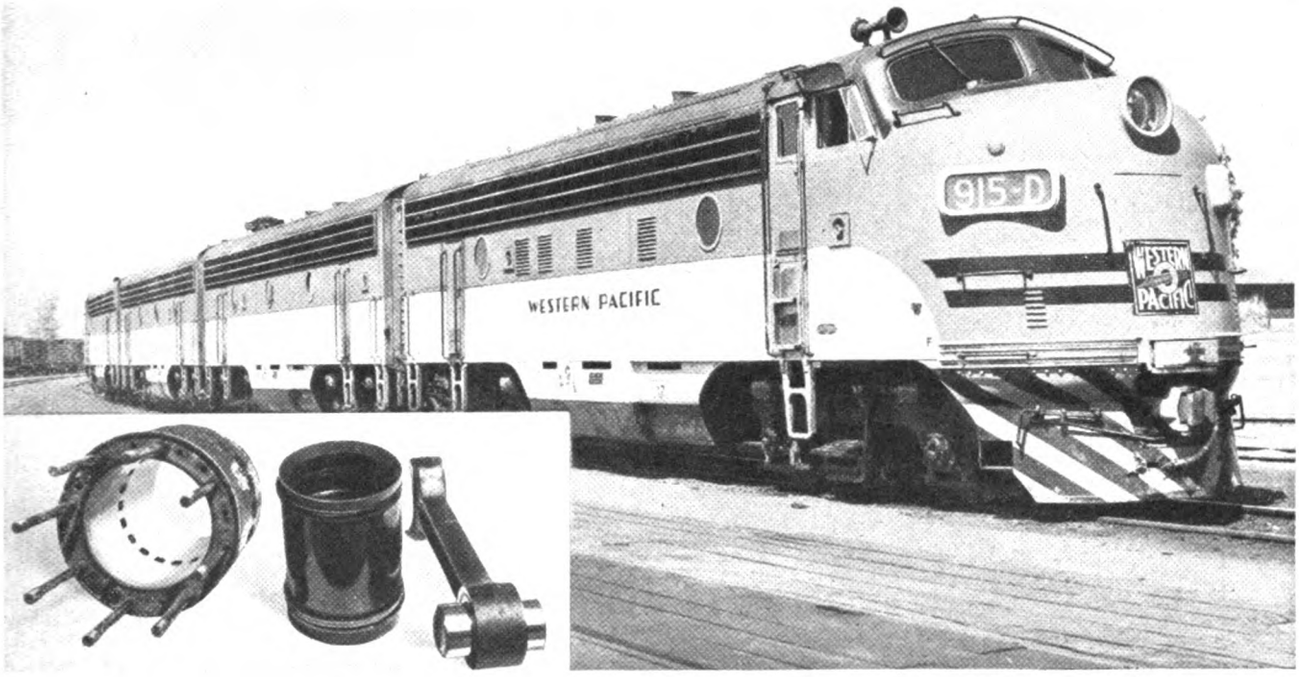
These wrenches are calibrated to an accuracy of plus or minus 3 per cent, plus a

The Engineer's Report

CASE HISTORY
RPM Delo Oil R.R.
LUBRICANT

Western Pacific R.R. Co.,
FIRM

Special oil maintains high average mileage record!



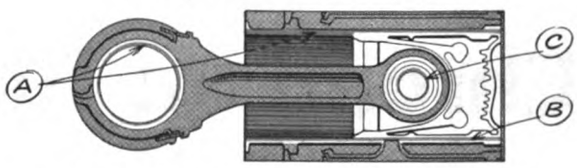
1776 CYLINDER ASSEMBLIES make up the 111 diesels in road freight service on the Western Pacific R.R. These units, as well as all passenger locomotives on the line, are lubricated with RPM DELO Oil R.R. Maintenance records of several years on freight locomotives show following average actual miles on parts removed for any reason: wristpins and bushings, 413,675 miles; pistons, 376,018 miles; liners, 354,101 miles. A representative assembly is shown in insert, just as it appeared after 476,497 actual freight miles. Note cleanliness of parts and free rings—typical of Western Pacific's experience with RPM DELO Oil R.R., the standard on the line since 1949.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



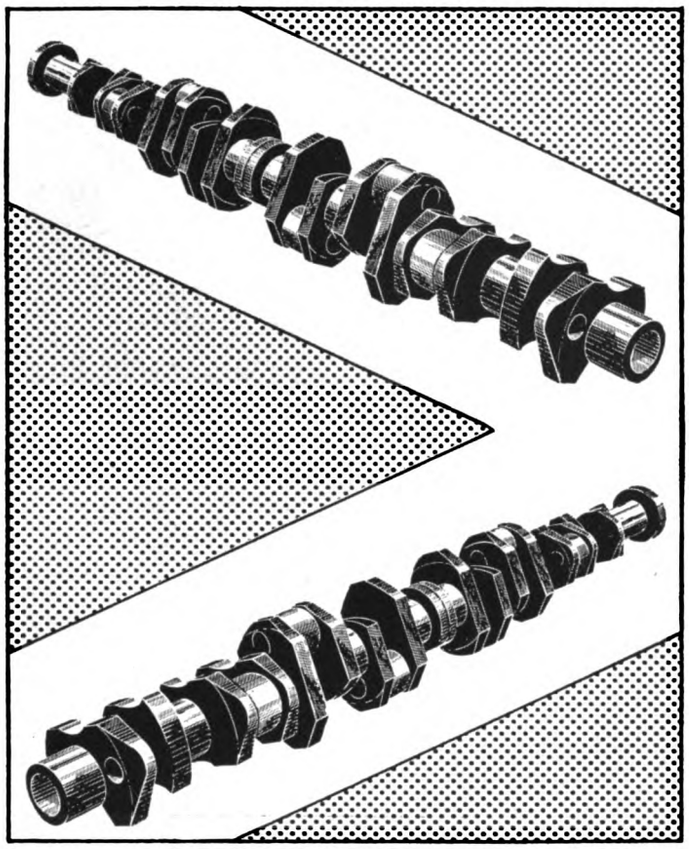
A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

CRANKSHAFTS



Chromium Plated

by

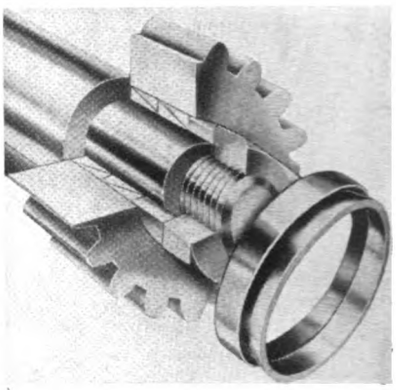
VAN DER HORST

OLEAN, NEW YORK

TERRELL, TEXAS

maximum of 2 lb. They are precision made with a fixed head bearing pin, improved roller block, side adjusting seal, and handle end seal. The devices use a torque-limiting principle instead of dials, scales and other indicating units. When the desired torque, set on the micrometer type handle is reached, the wrench releases automatically.

The new line of ten wrenches includes models with ¼, ⅜, ½, and ¾ in. drives, with plain and ratchet heads in capacities from 5 to 4,800 in. lb and 100 to 500 ft lb. Heavy duty models have extensive application in the manufacture and maintenance of diesel engines for locomotives, trucks, tractors, etc. *Plomb Tool Company, Los Angeles, Cal.*



Hub and Shaft Fastener

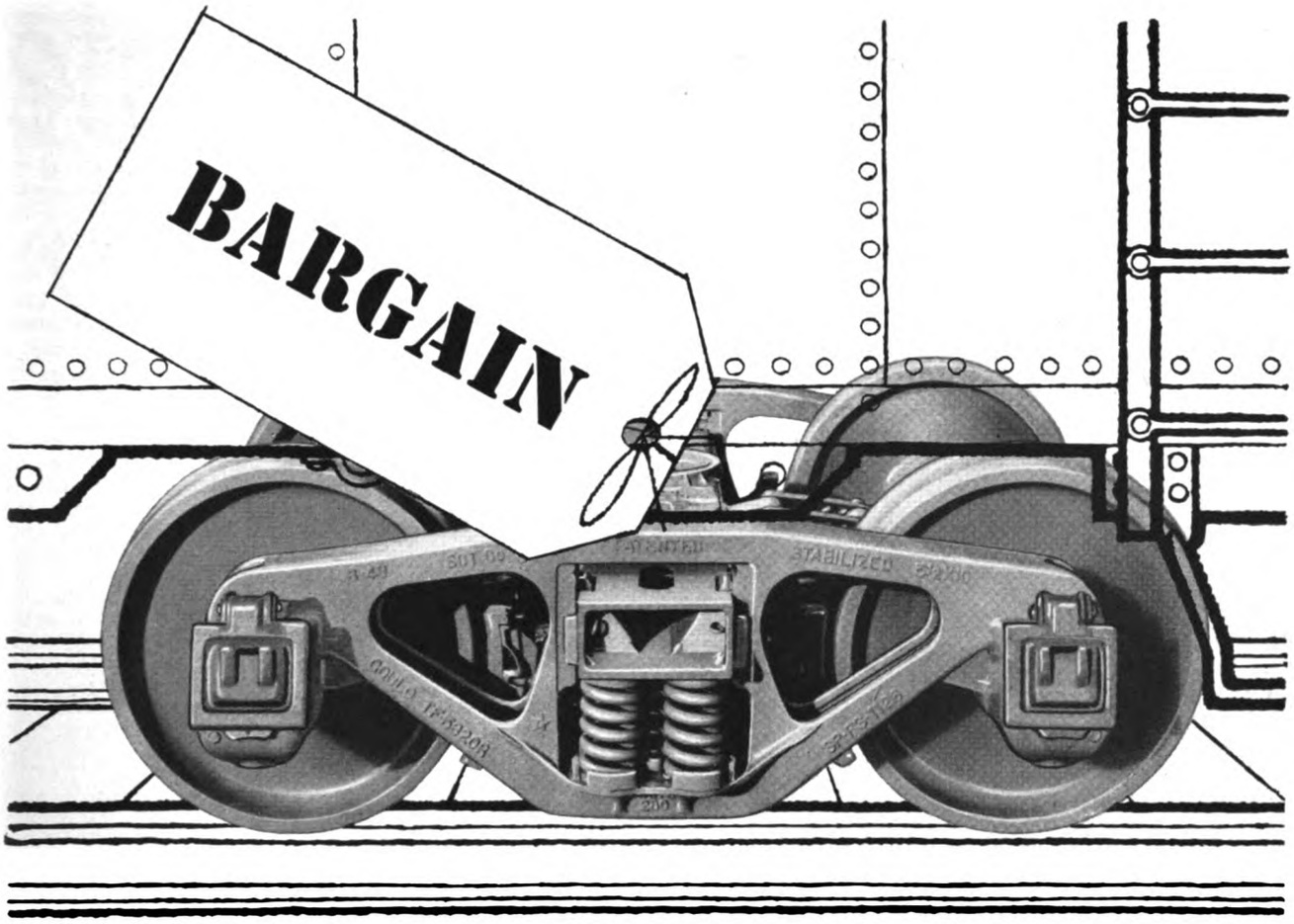
Gripspring is an assembly for fastening hubs onto shafts without the use of splines or keyways. It consists of a straight cylindrical shaft and hub core and is said to have all of the advantages of a shrink fit without any of its disadvantages.

In use, the device is wedged between the hub and shaft under heavy pressure made possible by use of hand tools. Its outer ring expands and the inner ring contracts. Because no clearances are present, it provides maximum torque for a given shaft diameter as full strength of both shaft and hub is utilized.

Advantages claimed are elimination of stress concentrations and notch effects; no relative motion, backlash play and hammering; elimination of grinding; less weight and space; no fretting or corrosion; perfect seals against air and liquids; elimination of costly machinery and hand-fitted assemblies; etc. *U. S. Automatic Corporation, Amherst, Ohio.*

Non-Ferrous Metal Cutting

A development based on the Heliarc welding process provides a method of cutting non-ferrous metals with a gas-shielded arc. Heliarc cutting is said to produce a saw-like



COSTS SO LITTLE . . .
GIVES SO MUCH PROTECTION

Today Barber Stabilized Trucks are a greater bargain than ever because their savings are greater! Higher speeds mean more chances for costly damage to ladings and equipment.

Barber Stabilized Trucks provide a safe, dependable system of suspension and protection. Actuating springs, friction shoes and wear plates work together as vertical dampers and truck resquaring devices. Bumps and bounces are cushioned and compensated, nosing and violent swivelling prevented. Thousands of damage claims are *completely eliminated;* your equipment is protected; rail pounding and track maintenance are reduced.

We firmly believe that *nothing* you specify does so *much* for your railroad yet costs *so little* as Barber Stabilized Trucks! Standard Car Truck Co., 332 S. Michigan Avenue, Chicago 4, Ill. *In Canada:* Consolidated Equipment Company, Ltd., Dominion Square Building, Montreal 2.

Specify Smoother-Riding

BARBER
STABILIZED TRUCKS

Manufacturers' Literature

Following is a compilation of free literature, pamphlets and data sheets offered by manufacturers to the railroad industry. Circle the number(s) on coupon below to receive desired information. Request will be forwarded direct by the manufacturers.

1. SNOW PLOWS. *Wm. Bros Boiler & Mfg.* 4-page 3-hole punched folder (RE-132) "Bros Front-End Loader Mounted Sno-Flyer Rotary Snow Plows" describes, illustrates and gives specifications on Series A rotary snow plows for wheel-type tractors and jeeps.

2. AUTOMATIC BOILERS. *Boiler Engineering & Supply.* 6-page folder (BE-3) describes and illustrates with photos and cutaway drawing Continental automatic boilers, oil or gas fired.

3. TURBOCHARGED ENGINES. *Cummins Engine.* 16-page booklet (12009) "More Profit With Cummins Turbodiesels" describes and illustrates the five Cummins Turbodiesels; includes working drawings and charts on fuel consumption, horsepower, engine weight and torque.

4. CAR LINERS. *J. W. Mortell.* 8-page folder "Now . . . Thanks to Armortex, They Never Need Be Written Again!" describes and illustrates Armortex tough permanent plastic car liner; discusses physical properties, application methods; photos show before and after Armortex.

5. BATTERIES. *C & D Batteries.* 48-page illustrated manual on lead acid batteries for all types of motive power applications; covers industrial cycle service, including railroad Diesel starting, carlighting, air conditioning service.

6. STORAGE TANK VENDING. *Protectoseal Co.* 12-page booklet "Venting Fundamentals with Protectoseal Equipment" gives operating principals and fundamentals of venting flammable liquid storage and process tanks.

7. CLEANING EQUIPMENT. *Magnus Chemical.* 36-page illustrated manual (10,000-G) "How To Select The Proper Method, Machine and Material" shows various types of cleaning equipment.

8. ROAD-TRACK CAR MOVER. *Whiting Corp.* 6-page bulletin (T-114) "Test Operations Report" and 16-page broadside bulletin (T-115) "Powerful, Versatile, Low Cost Hauls, Switches and Spots" describe, illustrate and depict uses of the new Whiting heavy-duty Trackmobile; includes history and development of this car mover.

9. ALUMINUM PIPE. *Aluminum Company of America.* 18-page booklet (AD 197) "Aluminum Pipe & Fittings" gives characteristics and advantages for each of its major fields of application; includes specifications, description of fittings and installation methods.

10. HOSE COUPLING. *Titeflex, Inc.* 20-page catalog (7-55-20) "The Higher The Pressure, The Tighter The Seal" describes and illustrates with photos and drawings the Quick-Seal line of quick connect-disconnect hose couplings and accessories.

11. STAINLESS STEEL FASTENINGS. *Star Stainless Screw Co.* 24-page catalog (55-A) "Stainless Steel Right Off The Shelf" describes, illustrates, gives specifications on all types of stainless steel fastenings by Star.

12. REINFORCED PLASTIC. *Minnesota Mining & Mfg. Co.* 20-page reference manual (P-SPRM) in file-folder style describes advantages, applications and procedures for using "Scotchply" brand reinforced plastic; 62 illustrations show uses; complete pricing data included.

13. GAS CUTTING MACHINE. *Air Reduction.* 12-page 3-hole punched catalog (804B) describes and illustrates the 6B Oxygraph Gas Cutting Machine and its accessories; photos show typical uses.

14. CARBON TETRACHLORIDE. *Chemicals & Materials Corp.* 12-page brochure "Literature Review on the Toxicity of Carbon Tetrachloride" discusses this group of useful but dangerous chemicals which has wide industry application as a fire extinguisher, metal degreaser, etc.

15. SPEED CHANGERS. *Allis-Chalmers.* 6-page 3-hole punched bulletin (20B6013D) *"Texrope* Drive Speed Changers" describe operating advantages of "Vari-Pitch" speed changers; includes arrangement diagrams, selection and speed range tables.

16. VIBRATION MOUNTINGS. *Vibration Mountings, Inc.* 8-page catalog (G-55) describes, illustrates, gives specifications on the line of vibration mountings; includes photos of typical installations and chart for determining minimum deflection required for selected vibration isolation efficiency.

17. DUCTILE IRON. *International Nickel.* 28-page revised booklet (2965) "Ductile Iron, The Cast Iron That Can Be Bent," with tables, charts and photos, gives up-to-date information on ductile cast iron; photos show applications.

Reader Service Department **DECEMBER, 1955**
Railway Locomotives and Cars
30 Church St., New York 7, N. Y.

Please send literature circled below:

1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17

Also, please send me additional product information as follows: (company, product & page number) .....

Name ..... **Title or Position** .....

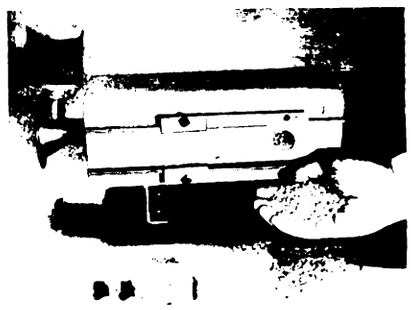
Company .....

Address .....

City ..... **Zone** ..... **State** .....

cut while the cutting speed is greatly increased and edge preparation and cutting costs are reduced. Heliarc cutting employs a high-temperature, high-velocity constricted arc between a tungsten electrode and the piece being cut. The energy of the arc stream melts and ejects a thin section of the metal to form a kerf. The jet-like removal of molten metal takes place in a gas atmosphere which prevents oxidation of the cut faces.

Equipment for mechanized and hand cutting is available. A mechanized cutting speed of 300 in. per min in ¼-in. aluminum is normal. With hand-cutting in ½-in. aluminum a speed of 60 in. per min can be achieved. While the process achieves with aluminum results much like those obtained with oxygen cutting in steel, studies are now underway on additional applications of Heliarc cutting to both the non-ferrous and ferrous fields. Major changes in the original Heliarc welding equipment are the addition of a pilot-arc starting circuit and a redesigned constricted nozzle. Most immediate application of the process in the railway field is the fabrication of aluminum tank cars. *Linde Air Products Company, 30 East 42nd street, New York 17.*



Catalytic Exhaust Purifier

The Oxy-Muffler is said to be the first catalyst exhaust purifier that can be used on leaded gasoline fuel for in-plant trucks. Through catalytic burning, it eliminates as much as 90 per cent or more of the carbon monoxide and most of the aldehyde and hydrocarbon fumes in engine exhausts. Fork lift trucks, power sweepers and other in-plant vehicles can be operated with greater safety in enclosed areas, according to the manufacturer.

Designed as a direct replacement for a truck's accoustical muffler, it can be quickly installed without major adjustments or carburetor changes. Inside the unit, in a horizontal row, are a number of chambers, each containing beds of tiny catalyst pellets. Hot gases flow down through the pellet beds where they come in contact with the catalytic agent. They are burned by catalytic chemical action to a safe, odorless exhaust of carbon dioxide and water vapor.

Tests indicate that the device will provide rated clean-up for at least 600 operating hours. When efficiency drops, the catalyst pellets can quickly be removed and replaced with fresh ones. The

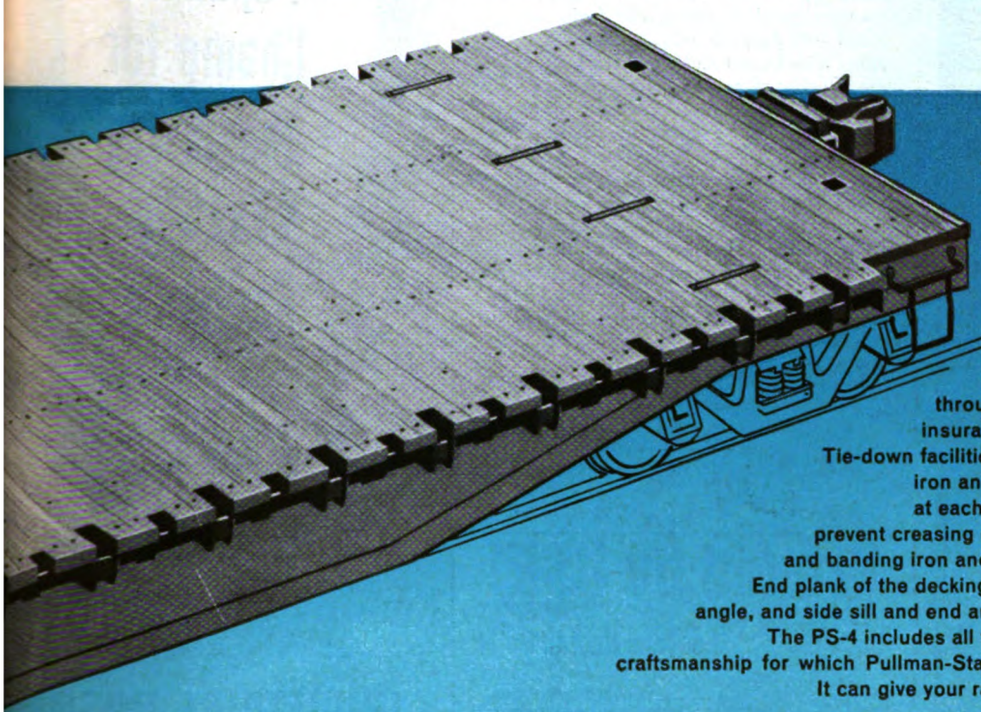
(Continued on page 108)

standardized flat car

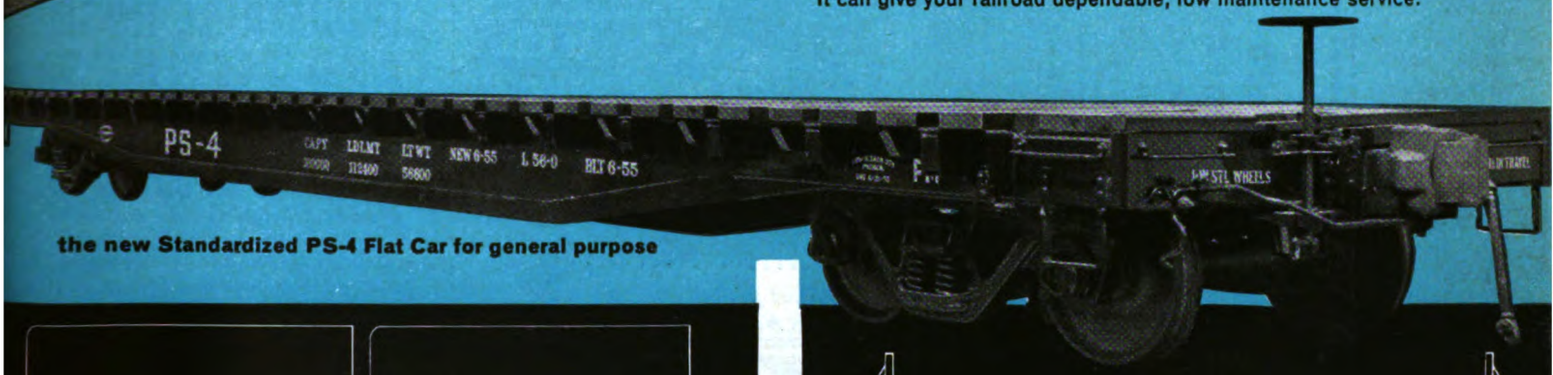
Pullman-Standard has designed and built a new flat car . . . the PS-4 . . . as the fourth unit in its line of Standardized Freight Cars. The new Standardized PS-4 Flat Car has been created to fill the special usages to which flat cars are traditionally put while exceeding in strength, versatility and dependability any preceding flat cars.

This new unit comes in lengths from 53′-6″ to 60′-0″, and in variations to 75′-0″ with both 50 and 70 ton capacities. In addition, its standardization is sufficiently flexible to allow Pullman-Standard engineers to work with PS-4 buyers for inclusion of bulkheads or piggy-back accessories if the car is to be used in special service.

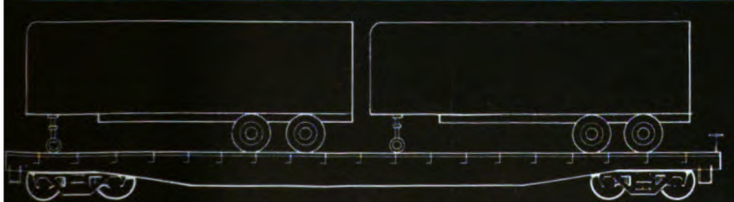
Now added to the list of such famous standardized Pullman-Standard freight cars as the PS-1 Box Car, the PS-2 Covered Hopper Car, and the PS-3 Hopper Car, the PS-4 will provide rugged, dependable service with a minimum of maintenance wherever it is sent on the Great American Railway System.



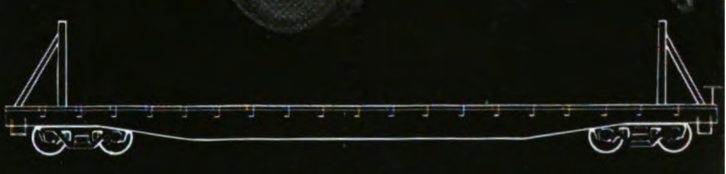
The new Standardized PS-4 Flat Car is of all-welded design, and exceeds all A.A.R. strength requirements. The underframe is unusually strong, and designed so the center sill and side sills work together through the cross members, including the bolsters. Decking is of 2¼″ preservative-treated lumber secured with bolts and floor clips. Each board is secured with 4 bolts extending through punched holes in steel framing, providing insurance against floor board shifting and skewing. Tie-down facilities consist of 18 stake pockets and 17 banding iron anchors per 53′-6″ car side plus 2 stake pockets at each end. Stake pockets are specially rounded to prevent creasing or cutting banding irons. Extra stake pockets and banding iron anchors can be added to buyers' specifications. End plank of the decking is protected during end loading by a special angle, and side sill and end are additionally tied together by a corner band. The PS-4 includes all the mass production economies and superior craftsmanship for which Pullman-Standard Standardized Freight Cars are noted. It can give your railroad dependable, low maintenance service.



the new Standardized PS-4 Flat Car for general purpose



the new PS-4 can be equipped for piggy-back service



and the new PS-4 can be provided with bulkheads

YOUR NEEDS CREATE THE PULLMAN "STANDARD"

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

SUBSIDIARY OF PULLMAN INCORPORATED

79 EAST ADAMS STREET, CHICAGO 3, ILLINOIS

BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

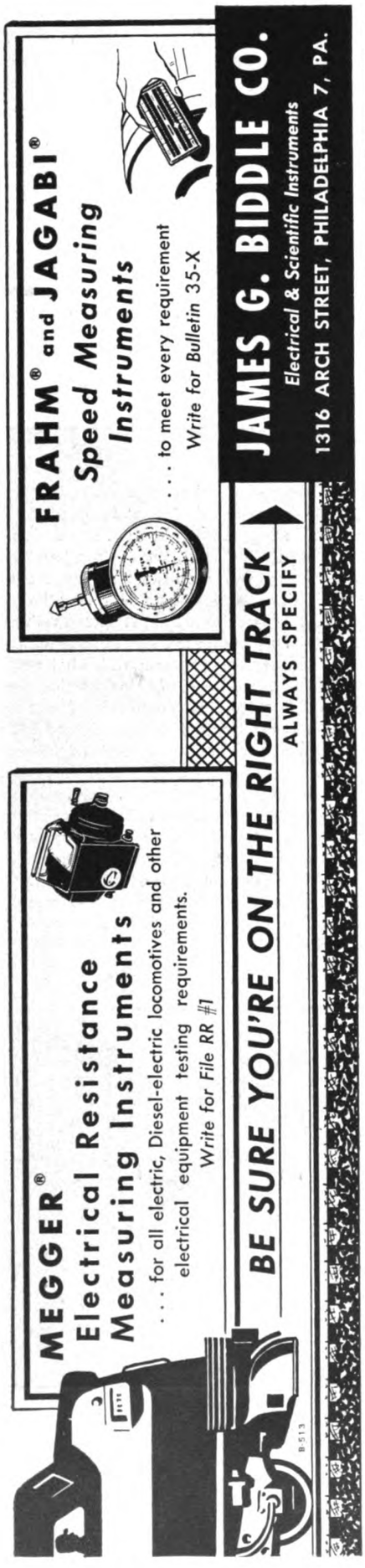
(Continued from page 102)

Oxy-Muffler comes in three basic sizes for engines with piston displacements ranging from 0-75, 76-150 and 151-230 cu in. *Oxy-Catalyst, Inc., Wayne, Pa.*

Rectifier Arcwelder

Designed expressly for inert gas shielded consumable electrode welding, the unit features constant arc voltage for all automatic machine welding applications employing constant speed wire feed. The device, designated 800 Ampere TCV, contains a three phase transformer and a rectifier tank. Coils are aluminum wound, silicone and glass insulated. Forced draft cooling is provided by a fan with a reversible ball-bearing motor.

Arc voltage may be preset over a wide range, from 15 to 44 arc volts. The voltage may also be preset to provide a higher initial voltage for ease in establishing the arc. Once arc is established, the voltage automatically adjusts to the preset value. *Air Reduction Sales Company, Division of Air Reduction Company, Inc., 60 East 42 street, New York 17.*



INDUSTRIAL HOSE AND FITTINGS

Super resistance to abrasion and corrosion makes this hose excellent for railroads, road equipment, farm machinery, and materials handling equipment. High tensile strength single wire braid. Tough synthetic rubber cover. Working pressures to 2500 psi. Bulk hose and fittings . . . complete hose assemblies at your dealer.

Write for BULLETIN
Dealerships open in some areas.

STRATOFLEX

STRATOFLEX, INC. FORT WORTH, TEXAS
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BRANCH PLANTS
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SALES OFFICES
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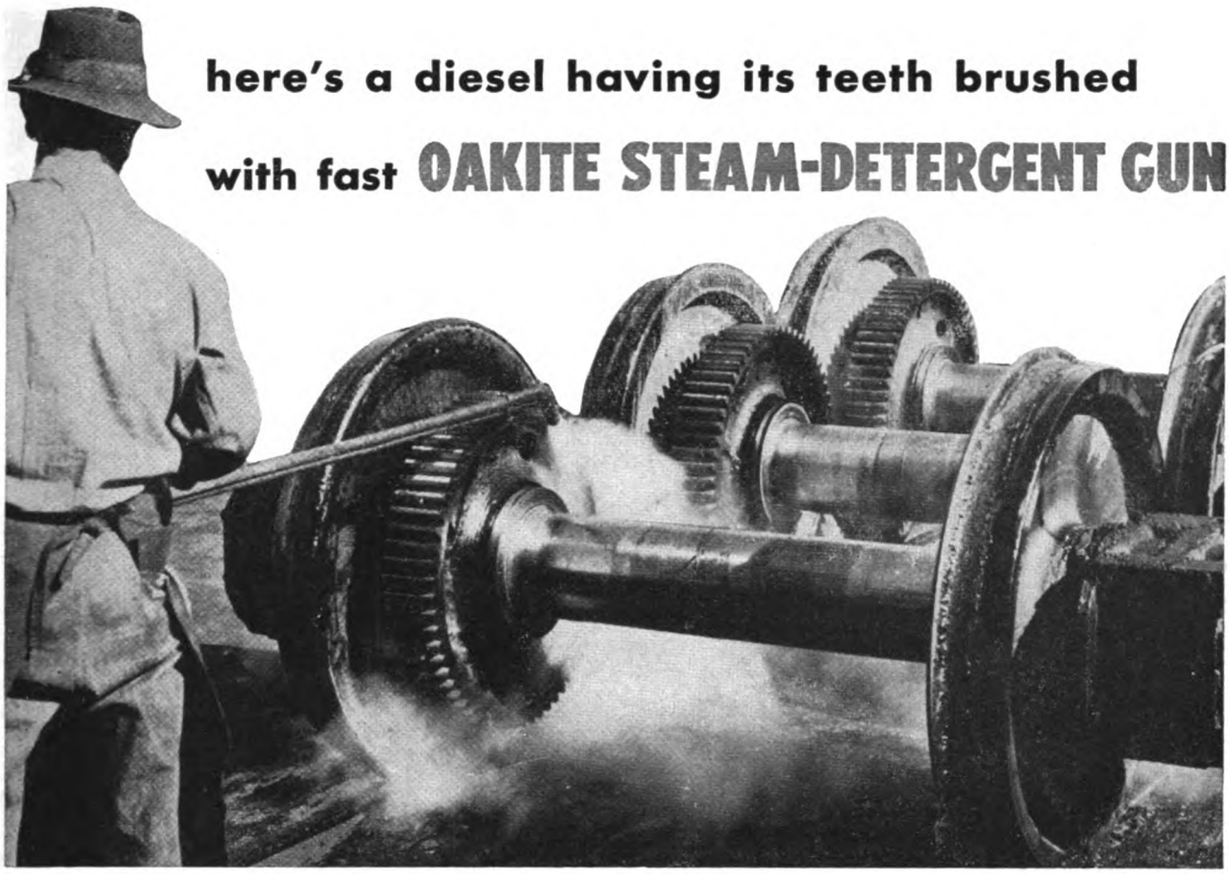
IN CANADA
STRATOFLEX OF CANADA, INC. TORONTO 18, ONTARIO

here's a diesel having its teeth brushed with fast OAKITE STEAM-DETERGENT GUN



Removing heavy-duty lubricants from recessed areas is a real tough assignment. And that's what you're up against when you have to remove Crater's Compound from between the bull gear teeth of Diesel driving wheels.

Pictured here is a man with the right idea. With no facilities for boiling out the compound by hot tank, he's blasting the stuff loose with the handy Oakite Steam-Detergent Gun. He's got down between the teeth... cleaned them to the very roots.

Next time you face this problem you try the Oakite Steam-Detergent Gun. You'll easily save up to 50% cleaning time. You'll speed up such other jobs as cleaning running gear, traction motors, trucks, locomotive frames before fracture tests. You can strip paint, too.

See for yourself the efficiency of Oakite Steam-Detergent Cleaning. Find out about this low-priced gun. Ask for demonstration without obligation. Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

OAKITE PRODUCTS, INC., 46 RECTOR STREET, NEW YORK 6, N. Y.
In Canada: Oakite Products of Canada, Ltd., 65 Front St. East, Toronto, Ont.

OAKITE

RAILWAY DIVISION

Safest distance between two points
At the height of the Christmas rush, go down to the nearest railroad station. Watch the throngs of old folks, parents, children, whole families as they board or leave the trains that take them or bring them home for the holiday. Everyone is happy and confident—they are traveling by train.
By making America's railroads so safe and so comfortable, you—in the railroad industry—have inspired the trust of an entire nation.
Merry Christmas
Westinghouse Air Brake
COMPANY
AIR BRAKE DIVISION
WILMERDING, PA.

IT'S CLEANED...WITH **TRANSPO**...BY TURCO

For *Diesel aluminum piston cleaning* and for cleaning other aluminum parts, many of America's leading railroads have found that Turco Transpo does a difficult job, speedily, effectively and safely. Transpo is but one of many Turco compounds developed especially for railroad use...is but one of the many reasons why, *for any cleaning job... any railroad cleaning job*...it's sound practice to *...turn to Turco first!*

TURCO PRODUCTS, INC.
Chemical Processing Compounds

Factories:
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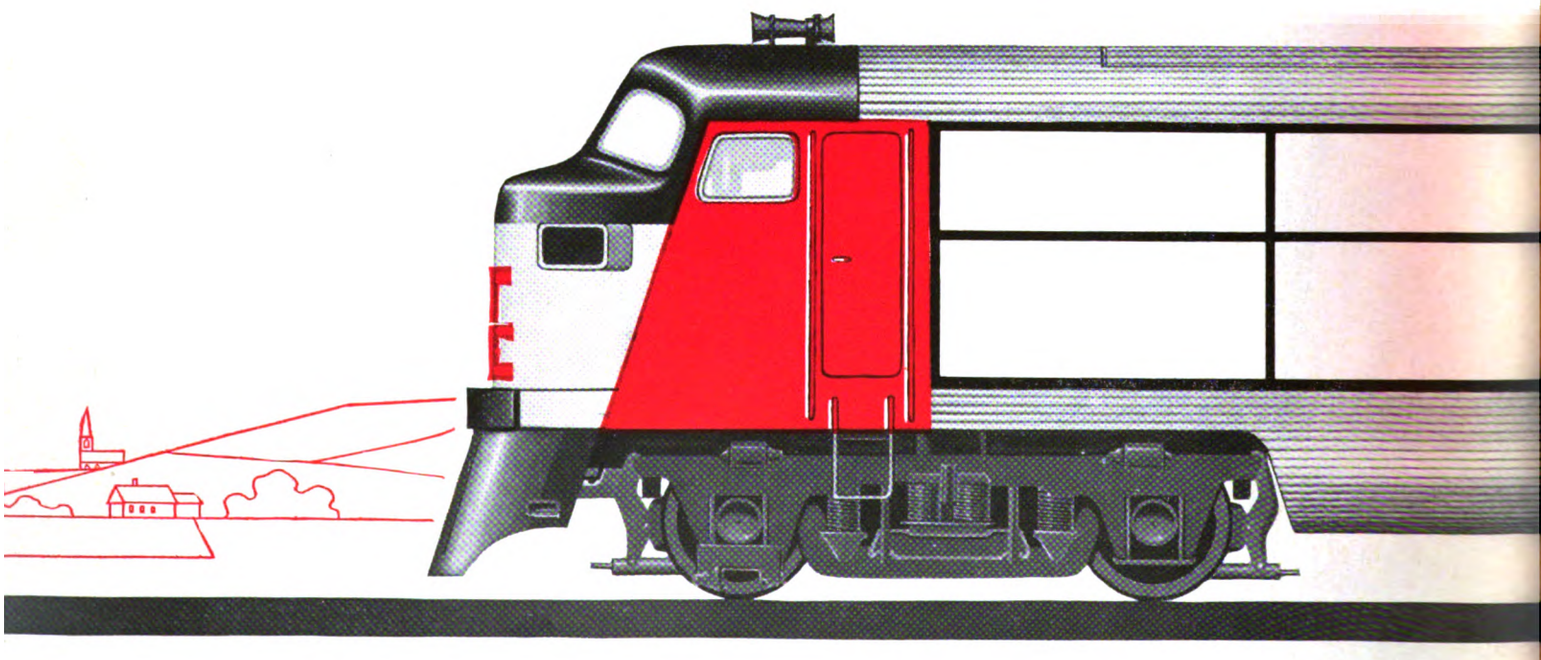
CHICAGO
HOUSTON
LOS ANGELES

6135 South Central Avenue
Los Angeles 1, California
RAILROAD DIVISION

PHOTO COURTESY OF UNION PACIFIC RAILROAD

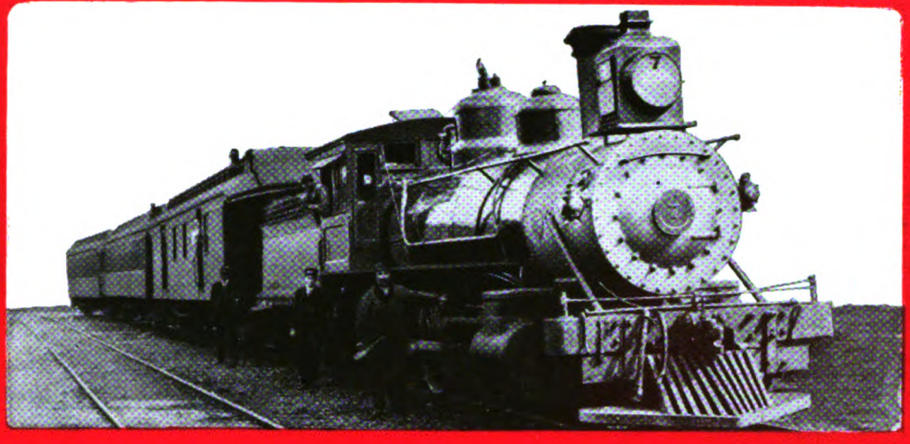
Fairbanks-Morse Speed



Newest Design

The Speed Merchant is the latest design of tomorrow's high-speed locomotive, ordered by the New Haven to handle new Talgo type equipment being delivered by ACF Industries.

It is a Fairbanks-Morse motive power design that combines the maintenance simplicity of a single engine power plant and the dependability of railroad proven Opposed-Piston Diesel power.



This handsome veteran, No. 7 of the Louisville and Nashville, paused to have its picture taken sometime around the turn of the century. It produced a tractive effort of 22,700 lbs., saw service for the L & N until 1932.

Then...and now...serviced with Esso Railroad Products

Valuable years of experience in research and development, along with continual testing on the road and in the lab, stand back of the outstanding performance of famous Esso Railroad Products.

Diesel Fuels
ESSO ANDOK Lubricants—versatile greases
ARACAR—journal box oils
ARAPEN—brake cylinder lubricant
ESSO XP Compound—hypoid gear lubricant
DIOL RD—Diesel lube oil
COBLAX—traction motor gear lube
VARSOL—Stoddard Solvent
SOLVESSO—Aromatic solvent
ESSO Weed Killer
ESSO Hotbox Compound
AROX—pneumatic tool lube
CYLESSO—valve oil
ESSO Journal Box Compound
Asphalt
Cutting Oils
Rail Joint Compounds
Maintenance of Way Products
Signal Department Products
RUST-BAN—corrosion preventive

Esso

RAILROAD PRODUCTS

SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

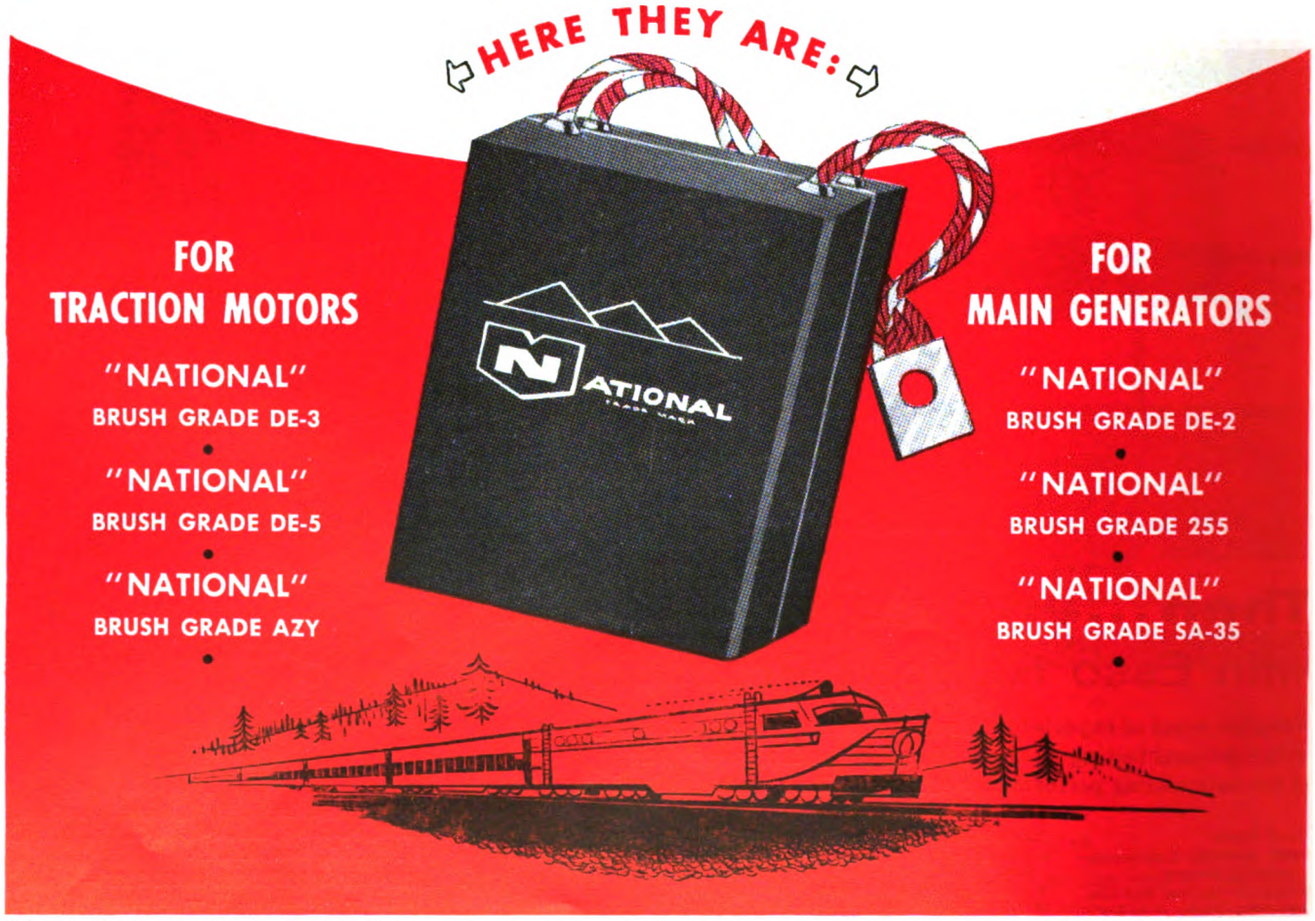
ESSO STANDARD OIL COMPANY — Boston, Mass. — Pelham, N. Y. — Elizabeth, N. J. — Bala-Cynwyd, Pa. — Baltimore, Md. — Richmond, Va. — Charlotte, N. C. — Columbia, S. C. — Memphis, Tenn. — New Orleans, La.

Why NATIONAL brushes are APPROVED by leading manufacturers of diesel-electric locomotives

"National" carbon brushes assure *top performance* and *economy*. This is due to a continuing railroad-brush-development program, in cooperation with leading locomotive manufacturers, which has resulted in much longer brush life and improved commutator condition in actual railroad operation.

You can save time and money with approved "National" brushes. That's why more of them are used on diesel-electric locomotives than on all other makes combined!

HERE THEY ARE:



FOR TRACTION MOTORS

"NATIONAL" BRUSH GRADE DE-3

"NATIONAL" BRUSH GRADE DE-5

"NATIONAL" BRUSH GRADE AZY

FOR MAIN GENERATORS

"NATIONAL" BRUSH GRADE DE-2

"NATIONAL" BRUSH GRADE 255

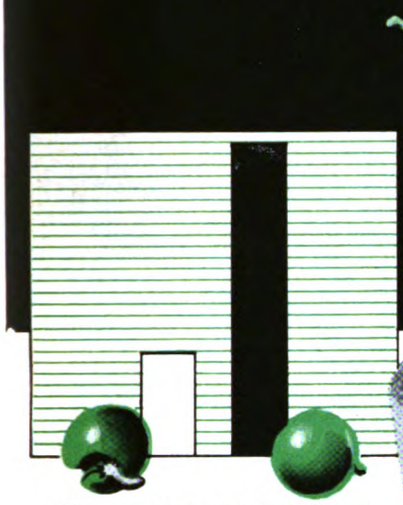
"NATIONAL" BRUSH GRADE SA-35

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

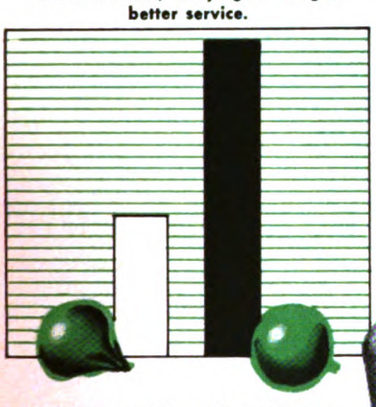
NATIONAL CARBON COMPANY • A Division of Union Carbide and Carbon Corporation • 30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. *In Canada:* Union Carbide Canada Limited, Toronto

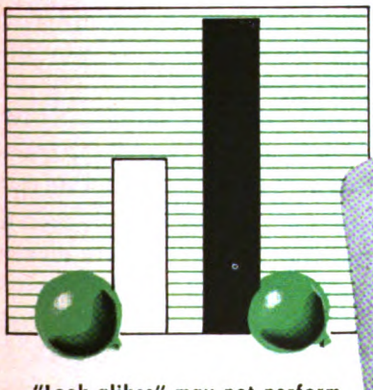
DO YOU BELIEVE THAT OIL FILTERS ARE AS ALIKE AS PEAS IN A POD?



Filter cartridges may have "worm holes" too. Because WIX Cartridges don't channel, they give longer, better service.



When a cartridge collapses in service, its performance drops. WIX density is electronically controlled.



"Look alikes" may not perform alike. Field and laboratory tests prove that WIX Engineered Filtration makes dollars do more work.

THE PROBLEM OF *KEEPING OIL CLEAN* IS IMPORTANT—DOUBLE CHECK FILTERS!

Engineered Filtration goes deep into the technical aspects of oil filter cartridges to deliver the outstanding performance you enjoy with WIX products. WIX Cartridges are handsome, yes . . . but their efficiency, long service and dependability show up most clearly on the balance sheet. The protection WIX delivers to your engines makes the big difference.

Whether the problem is filtering diesel fuel or lubricating oil, WIX's complete coverage and WIX Engineered Filtration represent the sound answer for Railroad Diesel Engines and Maintenance-of-Way Equipment. Here's Filtration keyed to YOUR specifications . . . YOUR equipment . . . YOUR type of operation . . . it makes sense and saves money for you!

WIX research and engineering is constantly testing and studying YOUR oil filtration problems—both in the laboratory and in the field. These facilities and this "know-how" is freely available to you.

Write for the complete WIX catalog or for the assistance of WIX engineers on your filtration problems.

wix

ENGINEERED FILTRATION

WIX CORPORATION • • • GASTONIA • N • C

WAREHOUSE STOCKS IN:

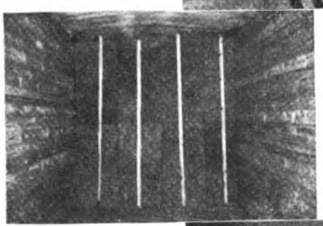
DES MOINES • SACRAMENTO

GASTONIA • NEW YORK • ST. LOUIS

Now! Low cost protection against boxcar infestation...

Economical Johns-Manville Stonefelt (Type K) reduces contamination risks, cuts damage claims

Open corrugations filled with Stonefelt. ▶



◀ Full-size pieces of Stonefelt temporarily in position.

End lining is applied the usual way. ▶

Many costly claims can be avoided by filling the spaces behind boxcar linings where contaminating conditions can exist. When you protect these areas with Johns-Manville Stonefelt® (Type K), danger from insect infestation, corrosion, mold and odor is controlled at the source.

Stonefelt is made of specially treated mineral fibers felted into lightweight batts that *will not settle or shake down.* Strong and durable, its uniform structure of finely divided fibers stops the entrance of insects; acts as a barrier against dust and dirt.

Stonefelt fibers are inert, are not affected by moisture, will not sustain insect life. Virtually indestructible in service, Stonefelt provides continued protection against mold, odors and corrosion.

Stonefelt Type "K" is furnished in cut-to-fit box car sets. Individual pieces are supplied up to 30" x 60" to assure maximum ease of handling. Regular car men can easily apply this material.

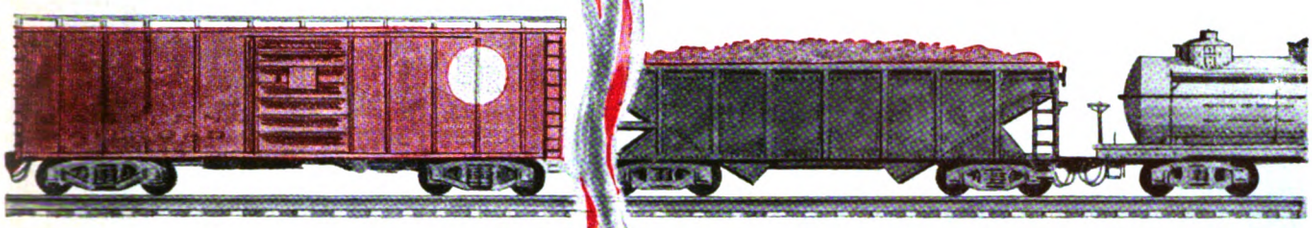
Ask your Johns-Manville representative for complete data and samples, or write to Johns-Manville, Box 60, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville 97 YEARS OF SERVICE TO TRANSPORTATION

No capital investment required to

ELIMINATE THE MAJOR



CAUSE OF HOT BOXES

with U.S. EVER-PAC

Ever-Pac now puts in management's hands the remedy for what has always plagued them and shippers—expensive hot boxes. Over one-half of all hot boxes are directly attributable to "waste-grabs." *Ever-Pac makes "waste-grabs" impossible.* Shippers get faster, more reliable service. Costly breakdowns are virtually eliminated.

More impressive still is the fact that U. S. Ever-Pac costs 3 to 14 times LESS than other devices. And because Ever-Pac is a superior replacement for waste packing—it can be classified as an *expense* item—and NOT capital investment.

"U. S." Research perfects it.

"U. S." Production builds it.

U. S. Industry depends on it.

A product of United States Rubber Company, U. S. Ever-Pac requires no costly special oil seals.

- Interchanges with present equipment, without shop modifications, machining or additional labor costs. • Low-cost initial installation.
- Easy determination of oil level. • Low-cost upkeep.
- Trouble-free service. • No mechanical parts to get out of order.

U. S. Ever-Pac has A.A.R. approval for application to a specified number of cars which move in general interchange service (Docket No. L-129). We will be happy to have an engineer call on you with full details. Write or get in touch with us at Rockefeller Center, New York 20, N. Y.

US RUBBER

Mechanical Goods Division

United States Rubber

UNITED STATES STEEL
USS
HIGH STRENGTH STEELS
TWENTY-TWO YEARS OF PERFORMANCE

190,000 freight cars have been built

COR-TEN Steel construction pays for itself many times over

It costs about $187 more to build a 50-ton A.A.R. hopper car with body sheets of high strength, corrosion-resisting USS COR-TEN Steel of the same thickness as would be used in copper steel.

But this money is well spent—the use of COR-TEN Steel actually pays for itself many times over. First by saving the cost of one heavy repair and second by saving the time out of service such a repair involves.

USS HIGH STRENGTH STEEL

better with USS COR-TEN Steel since 1933

The FRISCO turns to USS COR-TEN Steel

to minimize freight car repair costs and to assure longer service life

THERE IS SOUND THINKING behind the use of USS COR-TEN by the St. Louis, San Francisco Railway Co.

The steadily rising cost of freight car repairs has in recent years focused attention on the economic value of construction that, by more effectively resisting damage and deterioration, will help to reduce such expenditures.

As a result, more and more railroads are adopting a *long range* point of view in their car building and rebuilding programs and are today using COR-TEN Steel construction which they know from experience will keep cars longer out of the repair shop.

Take hopper cars for example. During the normal (35 years) life of a car, body sheets of copper steel must be replaced *two* or *three* times. Under similar conditions and during the same service life, COR-TEN Steel hopper cars will require *only one* replacement of body sheets.

Railroads have estimated that the savings in repair cost thus accomplished are 5 to 6 times the extra first cost of COR-TEN Steel over copper steel. What's more, other substantial savings result from avoiding the time out of service for the additional shopping required by the copper steel car.

It is with these facts in mind that the FRISCO line has in the past five years used USS COR-TEN Steel construction in 800 new freight cars: in 200 70-ton gondolas built in 1950, and in 300 70-ton drop end gondolas and 300 55-ton hopper cars built in 1953 by Pullman Standard.

These hopper cars have been built with future costs firmly in mind. USS COR-TEN Steel is used in all sheets that contact the lading. Their dimensions are significant: $\frac{3}{8}$ in. thickness in hopper chutes and longitudinal hoods; $\frac{1}{4}$ in. side sheets; $\frac{5}{16}$ in. in floor and cross ridge sheets.

When you consider that these sheet thicknesses are equal or heavier than AAR standards and remember that USS COR-TEN Steel has 50% higher yield point than structural carbon steel, has 60% higher endurance limit and 4 to 6 times the resistance to atmospheric corrosion of plain carbon steel or 2 to 3 times that of copper steel, you will agree that longer life than usual and low repair costs can confidently be predicted for this FRISCO equipment.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—
Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

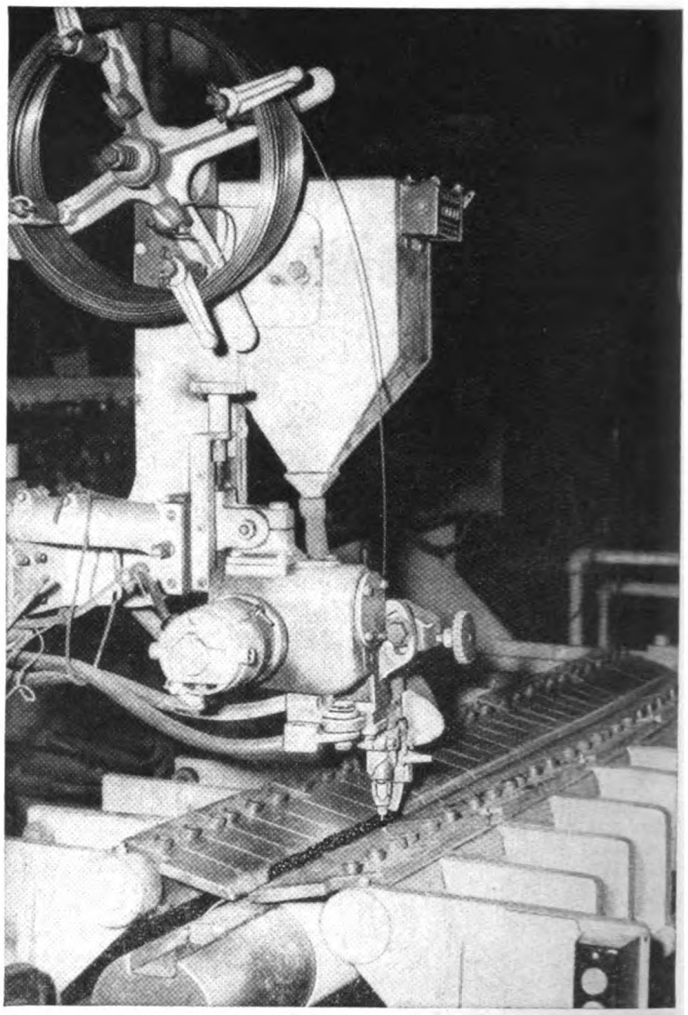
UNITED STATES STEEL

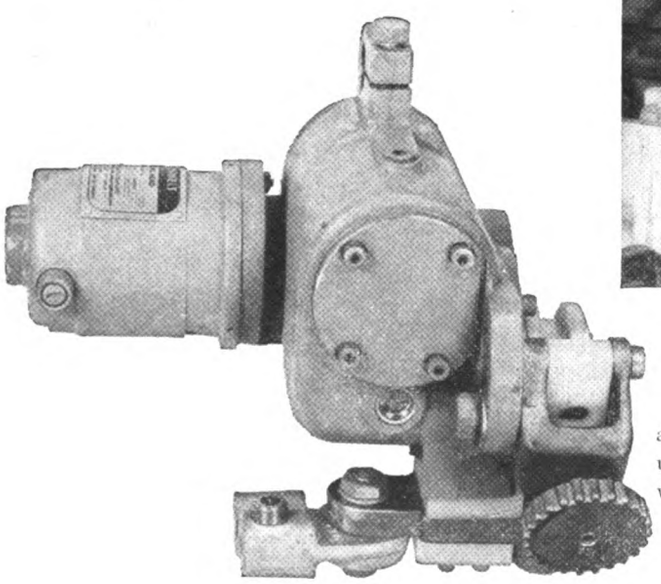
CUT *maintenance costs on tough welding jobs with the* New UNIONMELT DSH *welding head*

Trade-Mark

Here's the low cost, submerged melt welding head that saves maintenance costs on tough welding operations. The new UNIONMELT DSH head combines the flexibility of the lighter units with the ruggedness needed in heavy-duty welding machines. Large, sturdy gears and bearings give long, trouble-free service though work may involve frequent starts and stops and feeding heavy electrode wire. Simple controls and mounting arrangements make the DSH head easy to operate and maintain.

UNIONMELT welding joins thin metals at speeds up to 200 in. per minute or makes one-pass welds with a 3-inch penetration if desired. If you have a production job in your plant that requires high-quality welds made at high speeds, ask your nearest LINDE Office today for more information about UNIONMELT welding. A LINDE Engineer will be glad to help you plan your UNIONMELT installation for high-speed, production welding.





With the new UNIONMELT DSH head now available in five output speeds, you can select the best unit you need for making high-quality low-cost welds at the highest welding speeds.

RAILROAD DEPARTMENT

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

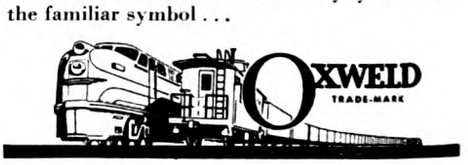
30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

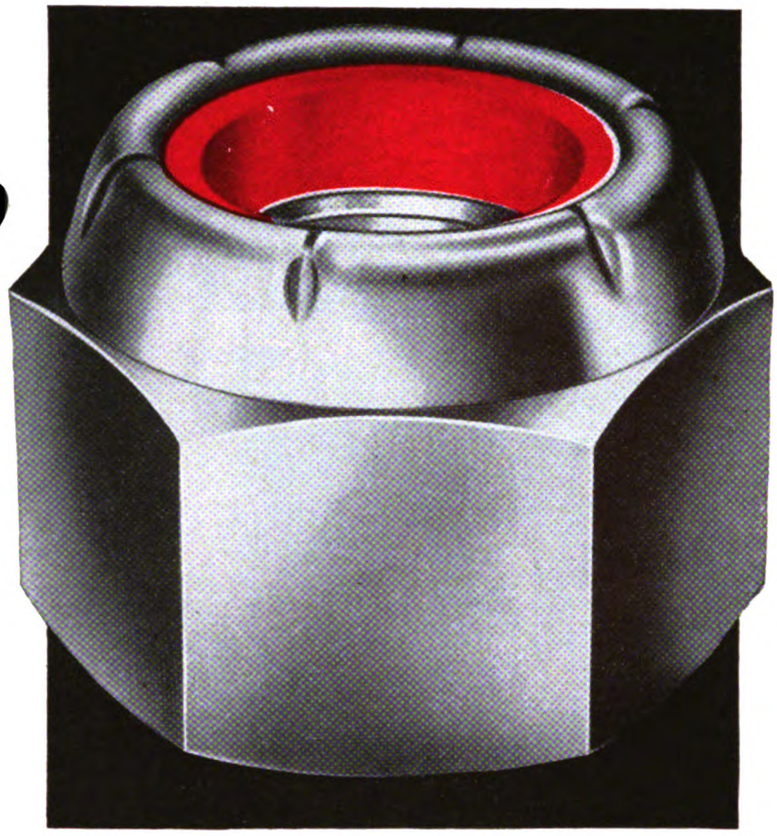
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Supplying to railroads the complete line of welding and cutting materials and modern methods furnished for over forty years under the familiar symbol . . .



What's special about this STOP NUT?

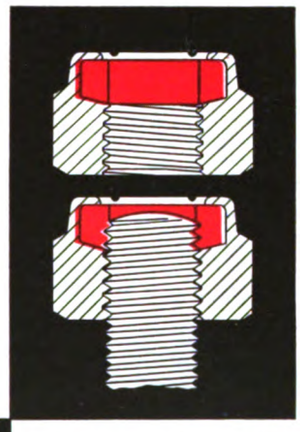


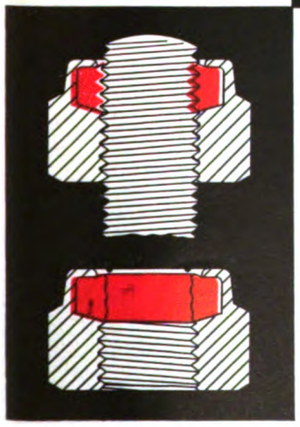
Several things make this nut unusual. For instance, you can "stop" it at any position on the threaded length of the bolt . . . or wrench it tight against the work where it protects bolt threads against corrosion and prevents liquid leakage. No matter where you leave it on the bolt, it will remain tight in that exact position, even though you subject it to heavy vibration and shock loads. But use a wrench on it and it comes off as easily as it went on. The red locking collar is nondestructive—does not gall bolt threads or remove plating. You can remove it and re-use it again and again.

What gives it its grip?

1 The locking collar is unthreaded and elastic. It has an inside diameter smaller than the major diameter of standard bolts.

2 The bolt impresses a mating thread into the collar and the resulting compressive forces exert a constant friction grip on the bolt. . . .





3 and exert a downward thrust bringing the lower flanks of the bolt thread into firm metal to metal contact with the matching nut threads, eliminating normal axial play.

4 Nut is removable and reusable . . . the Red Elastic Collar retains its grip after repeated usage.

Will it hold under ALL conditions?

The locking principle of the Elastic Stop® nut has been tested and proved by over 25 years of actual field service. Elastic Stop nuts are used on locomotives . . . and pile drivers. They fasten hedge shears and harvesters, drilling rigs and washing machines, trucks and roller skates. And no Elastic Stop nut customer has ever stopped using them because of unsatisfactory performance.

What about sizes and materials?

Elastic Stop nuts are available from a watchmaker's 0-80 all the way to 4"—in materials that include stainless steel, brass, aluminum and other alloys. Protect your product with "fastener insurance." Try Elastic Stop nuts on trouble spots, whether to protect expensive heavy equipment from costly downtime or to guarantee the accuracy of delicate electrical equipment by maintaining precision adjustments. We'll supply free test samples.

ESNA® TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. N82-1223, 2330 Vauxhall Road, Union, N. J.

Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

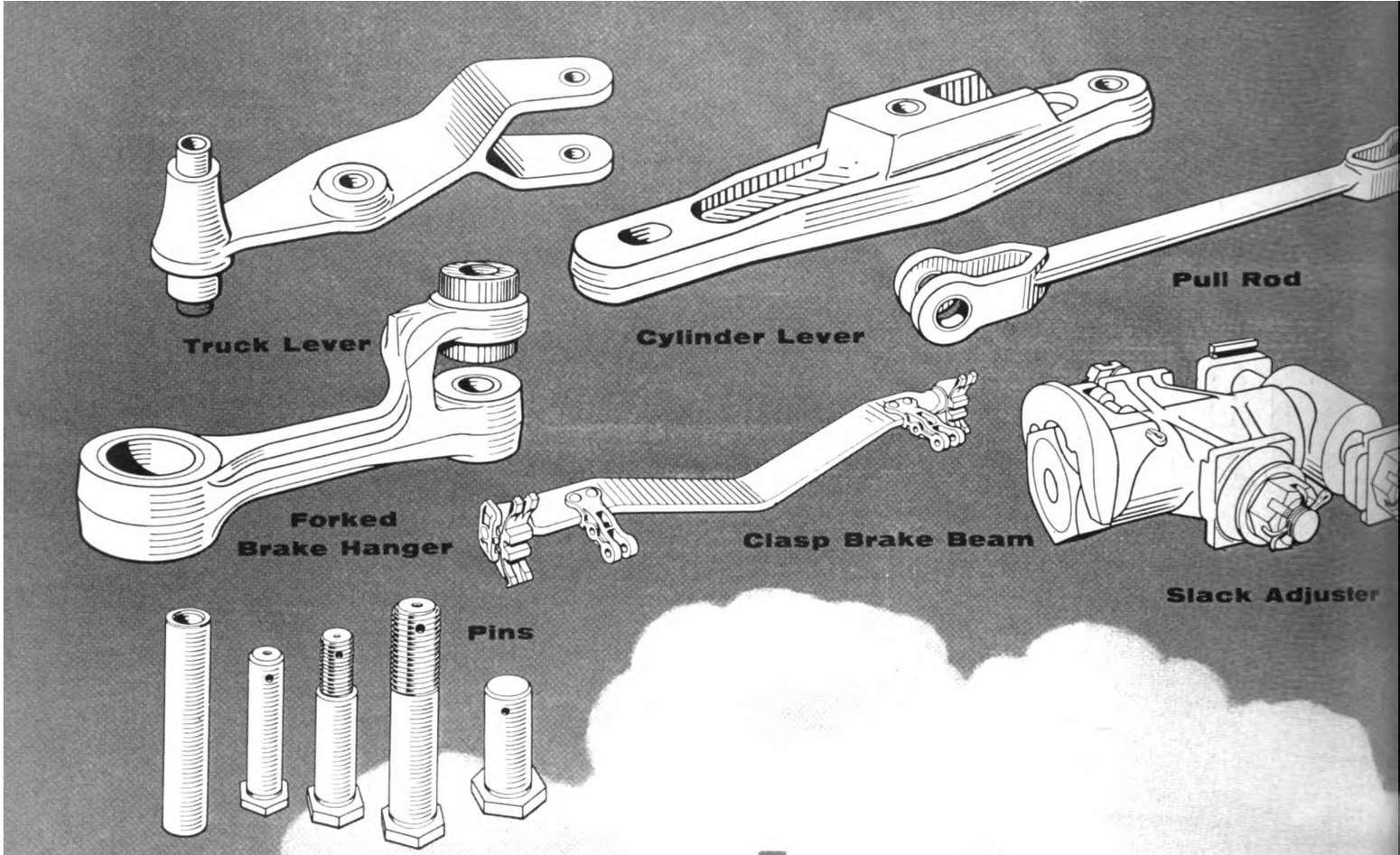
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

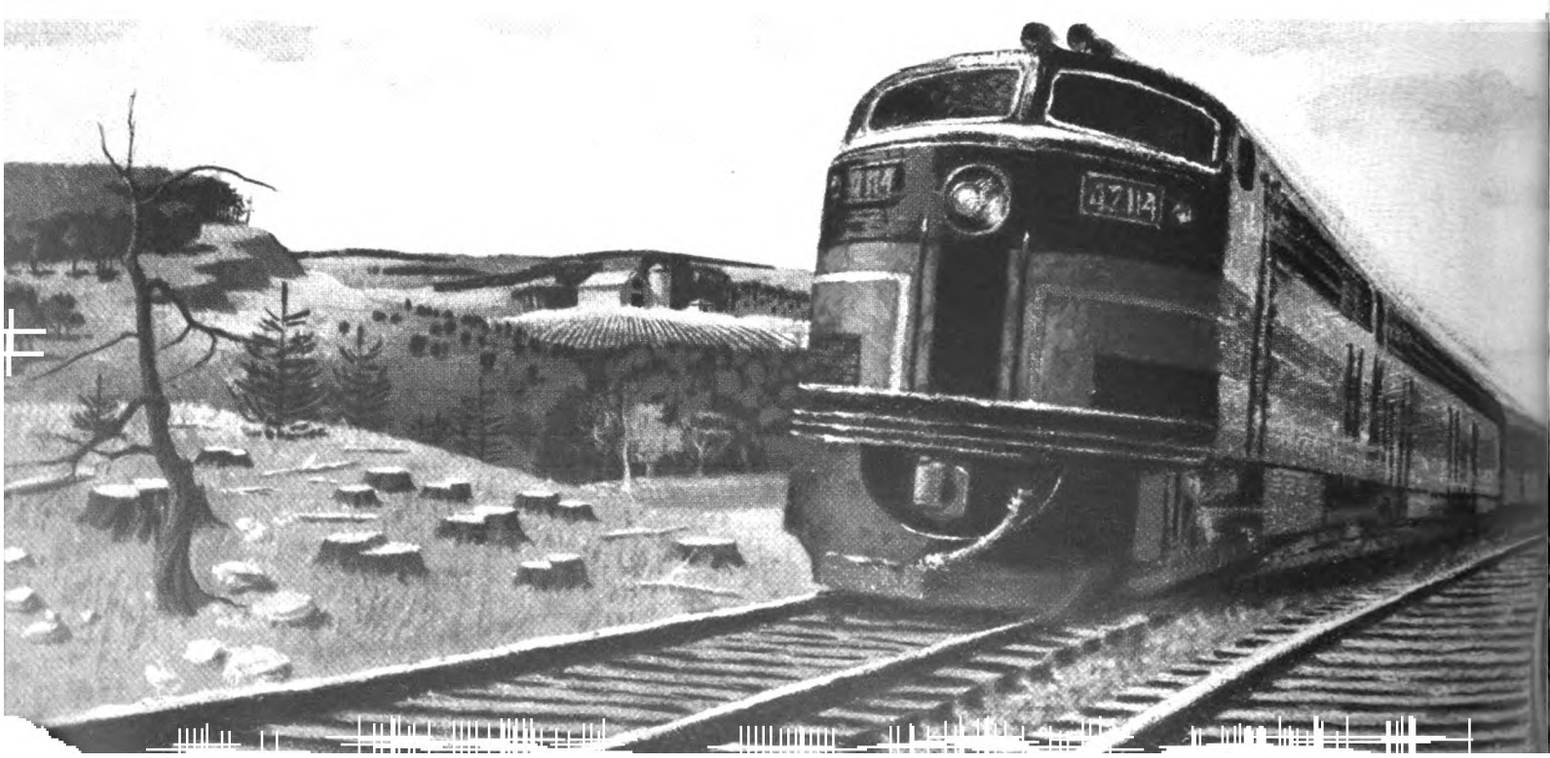
Firm_____

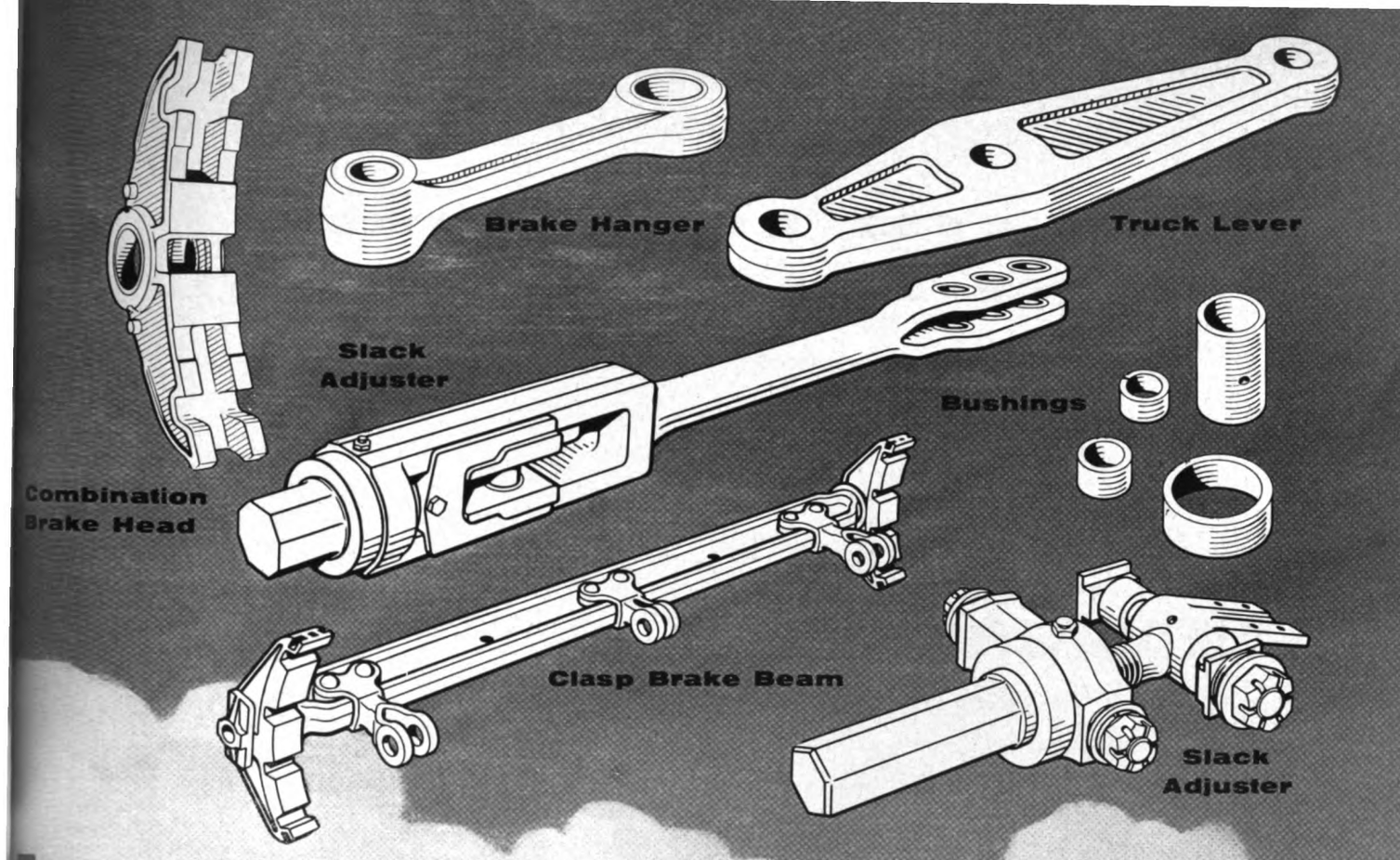
Street_____

City_____ Zone_____ State_____



For the best in





brake performance...

Bring your parts requirements to the source that's equipped for SERVICE

Brake repair parts from two sources may *look* alike—but they don't necessarily *perform* alike. Each part you order from ASF gives you the finest possible service . . . because each reflects constant brake research and development.

As just one example, all ASF Pins are now induction-hardened. The equipment needed to do this job meant a big investment. But, it was entirely justified by a big increase in effective depth of hardness . . . another way of saying *longer service life*. As another example, Brake Heads now have hardened faces . . . additional processing that improves service performance.

That's typical of the advantages—*to you*—of working with brake specialists. And when it comes to production efficiency, ASF lines are specially set up for producing all types of brake components. All operations, from forging, casting and welding through final machining, are handled by us: *you order from one source with one responsibility for quality.*

To serve you promptly we maintain a large inventory of active brake parts for your convenience. So, when you want brake service, call in your ASF Representative!

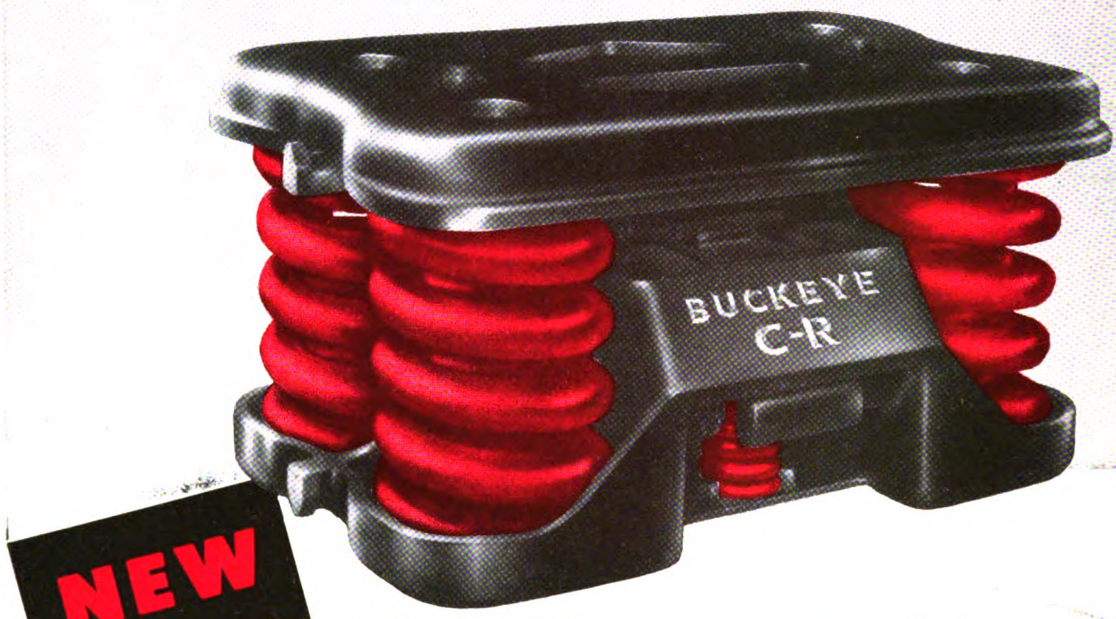
ASF

AMERICAN STEEL FOUNDRIES

410 North Michigan Ave., Chicago 11, Ill.

Canadian Sales: International Equipment Co., Ltd., Montreal, Quebec

LOW COST MODERNIZATION FOR CARS OF ALL CAPACITIES..



NEW

C-R®

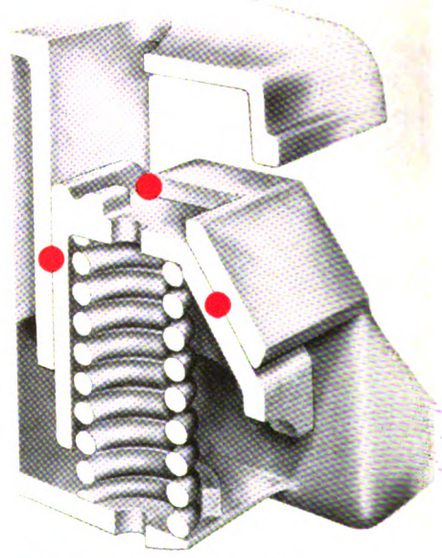
(Cushion-Ride)

PACKAGE UNIT

Applicable to *all* previously built, non-friction control trucks. Available with 2-1/2″ or 3-1/16″ spring travel.

ENGINEERED and BUILT BY

Buckeye



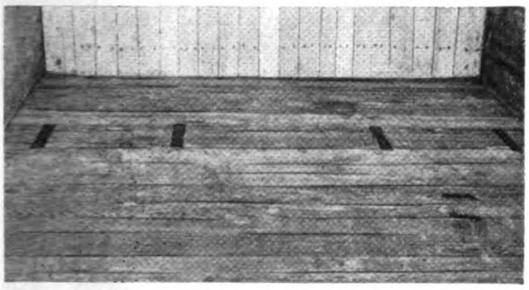
CUTAWAY OF THE BUCKEYE C-R PACKAGE UNIT SHOWING THE FEATURED MAXIMUM FRICTION BEARING SURFACES.

FOR COMPLETE INFORMATION.. CALL OR WRITE

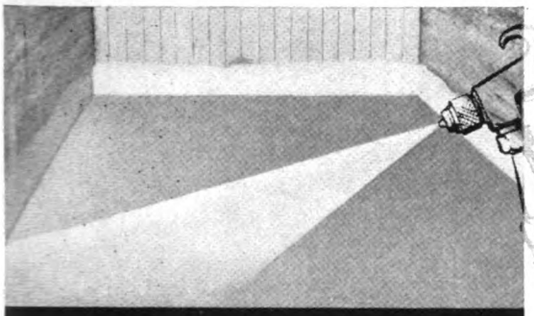
Refer Adv. 11880

Ask for Bulletin No 204

Now...



BEFORE AFTER



A PROTECTIVE COATING

FOR BOX CAR INTERIORS THAT LASTS INDEFINITELY

ARMORTEX

UPGRADES ANY CAR INTERIOR TO MEET HIGH TARIFF LADING REQUIREMENTS

- **SMOOTH, TOUGH SURFACE—EASILY SWEPT OR WASHED OUT**
- **ADHERENT**—a mastic which bonds to surface. Not a strippable material
- **FLEXIBLE**—tough, but not brittle. 1/8" film will bend around 1" mandrel
- **SOLVENT RESISTANT**—unaffected by mineral spirits, water or gasoline. Wood color of film will not stain or discolor
- **NON-HAZARDOUS**—an oil-in-water emulsion. Presents no fire hazard in storage or application.
- **INSECT RESISTANT**—made of synthetic resin and mineral fillers—absolutely impervious to insects.

Here's really big news the whole railroad industry has been waiting for! Now, for the first time, it is possible to apply a quick, economical protective coating to box car floors and walls which insures the *permanent,* superior surface needed for shipment of high grade bulk commodities such as grits, flour, sugar and grain.

Armortex, an amazing new discovery of the J. W. Mortell Railroad Division, completely eliminates the costly preparation of cars for individual loadings. Internal car surfaces coated with Armortex no longer splinter or deteriorate under normal operating conditions . . . thus resulting in a reduction of claims due to leakage, infestations, package damage.

Still another big advantage of new Armortex is its ease of application. One man can cover a box car floor in less than 30 minutes . . . readying the car for service the next day. By spraying, brushing or troweling, Armortex can be applied at any shop, rip-track or siding without returning the car to a central maintenance location.

Write today for free illustrated booklet giving full details on Armortex

JW Mortell COMPANY
KANKAKEE, ILLINOIS

Serving American Railroads Since 1895

SEND COUPON TODAY!

J. W. Mortell Company
550 N. Hobbie Ave.
Kankakee, Illinois

Please send me FREE copy of Bulletin Q-55

Name_____

Company_____ Position_____

Address_____

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"Best Operating Insurance Money Can Buy"

America's Finest!
GOULD KATHANODE
BATTERIES
for Air Conditioning
and Car Lighting

When you buy a Gould Research-Built Battery, you not only get the finest battery modern science can give you . . . you get also the finest, nation-wide field engineering service in the industry.

Strategically located in all principal cities, Gould Field Engineers are as near to you as your telephone . . . ready to help you get greatest possible service from your batteries and keep your facilities in operation. Through educational work with your maintenance staff, advice on selection and anticipation of battery needs and actual emergency servicing of batteries, your Gould Field Engineer is perfect operating insurance.

Call him in. You'll find it the best move you ever made. Don't forget to ask him for the new Gould Plus-Performance Plan material for your maintenance staff.

Always Use Gould-National Automobile and Truck Batteries

GOULD
Batteries

"BETTER BATTERIES THROUGH RESEARCH"

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

©1955 Gould-National Batteries, Inc.

Simplex Cables power and control longest, single-span vertical-lift bridge in the world!

U. S. Army's 544-foot railroad span over Cape Cod Canal raised 130 feet with ANHYDREX

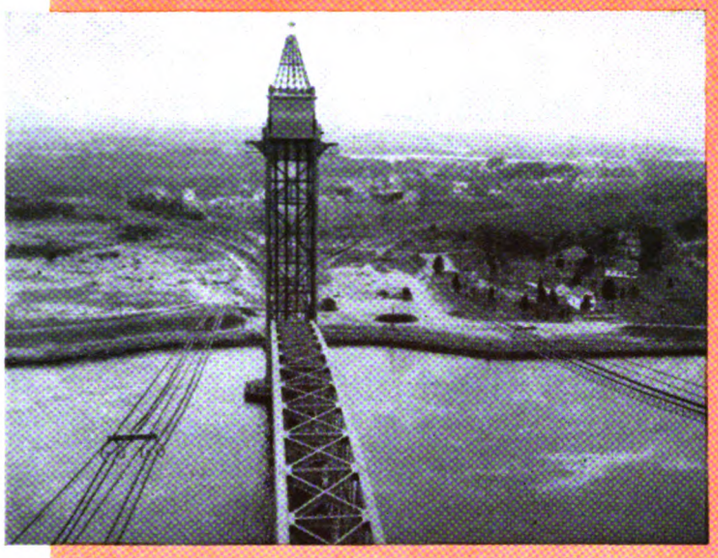
The 2200-ton span, located near Buzzards Bay in Massachusetts, carries the only railroad track between Cape Cod and the mainland.

Army and Air Force installations on the Cape depend upon this track for supplies. Therefore, both normal and emergency electrical circuits on the bridge must be as near perfect as possible.

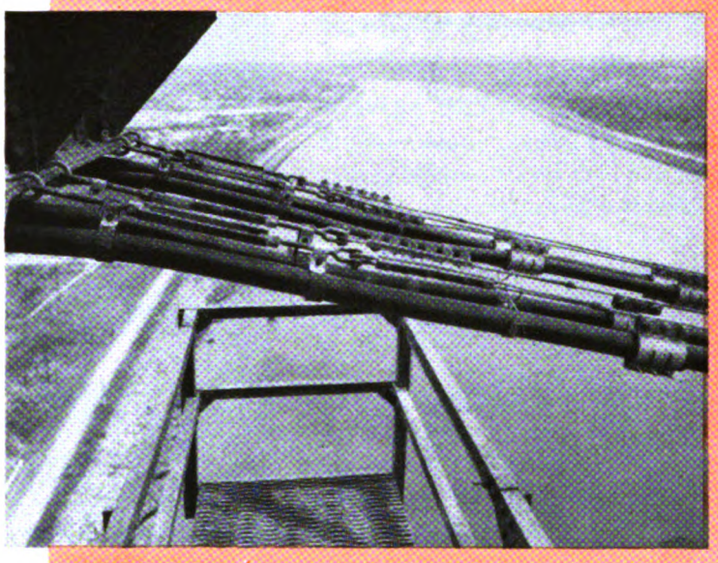
The railroad company that maintains the bridge specified Anhydrex-insulated cables with neoprene jackets. Army engineers, who own and operate the bridge, approved this choice.

ANHYDREX Cables withstand effects of moisture, corrosion from salt air, sunlight and swaying in high winds.

Want the same service from power and control cables as the Army engineers? Ask your nearest Simplex representative about ANHYDREX Cables, or write to the address below.



Cape side of canal with bridge span down. Seven of nine cables visible are Simplex-ANHYDREX. Light-colored square beneath catwalk is 1100-ton concrete counterweight that rides inside the framework of each tower.



Closeup of ANHYDREX Cables. Mainland on left. Span is raised and lowered by two 150-horsepower electric motors that turn 16-foot sheave wheels atop the bridge's two towers.

Simplex-ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Massachusetts

when you weigh the Chilled Car Wheel against any other wheel in freight car service

give weight to the factors that count most with you

economy AMCCW chilled car wheels are low in first cost, high in exchange value, require little or no "foreign line" freight charges, permit smaller inventories.

performance AMCCW chilled car wheels have a better over-all safety record than any other wheel in freight car service, according to ICC records. The outstanding performance of the *new* AMCCW wheel has improved the chilled wheel safety record every year since it was introduced in 1950.

accessibility AMCCW chilled car wheels are made in 24 plants coast to coast; they are quickly accessible to every railroad.

Low first cost • Short-haul delivery • Reduced inventory • Available locally
Low exchange cost • Increased ton mileage • High safety standards
AMCCW plant inspection • Easier shop handling

Association of Manufacturers of Chilled Car Wheels

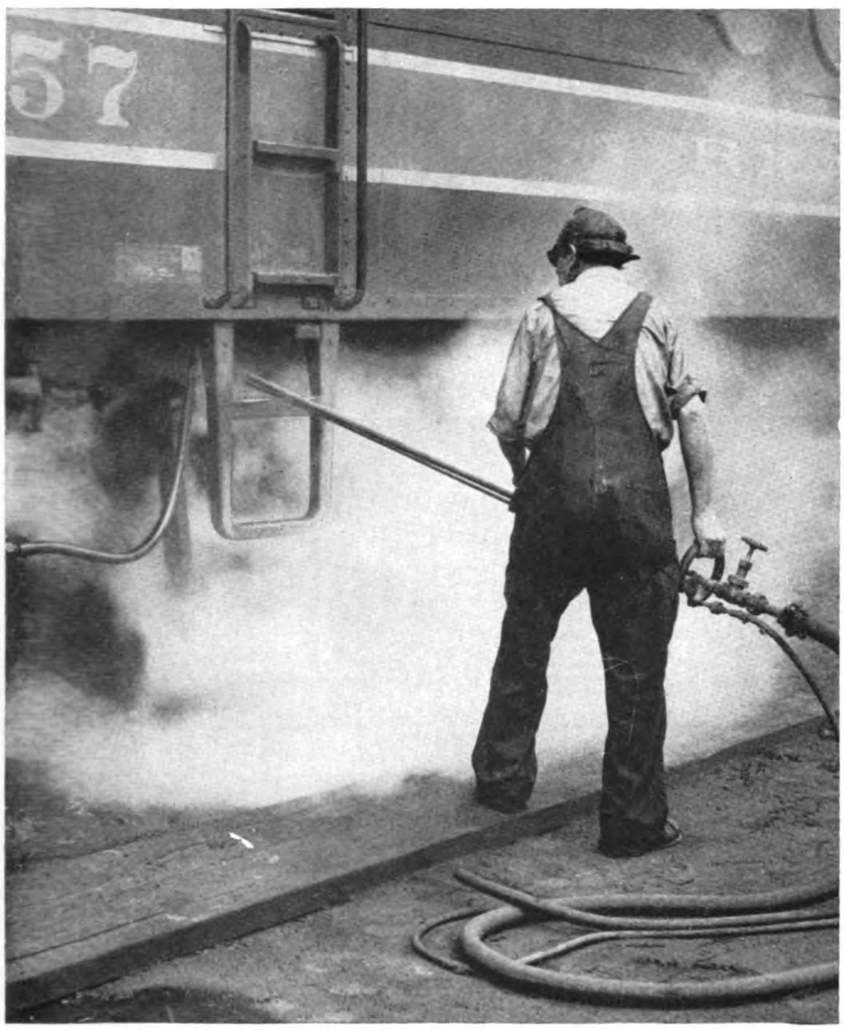
445 North Sacramento Boulevard, Chicago 12, Illinois

member companies:

Albany Car Wheel Co. • ACF Industries, Inc. • Marshall Car Wheel & Foundry Co. • Griffin Wheel Co. • Pullman-Standard Car Mfg. Co. • Southern Wheel (American Brake Shoe Co.)

GET BETTER-LOOKING TRUCKS AND UNDERFRAMES

with brand-new PENNSALT CLEANER 50



For the toughest, hardest-to-remove soils on trucks, underframes, wheels, oil tanks, here's the best answer yet—from Pennsalt's Whitemarsh Research Laboratory . . .

PENNSALT CLEANER 50 is a heavy-duty, balanced alkaline detergent that penetrates all the varied soils picked up throughout the country, loosens the most stubborn deposits for easy rinsing off.

IN EVERY TEST Pennsalt Cleaner 50 has consistently produced a *higher percentage* of clean trucks than any other material or combination of materials tried. It needs no babying—it can be applied by manual spraying, by steam guns, by automatic washing equipment, or with a plain bucket and brush.

TRY NEW PENNSALT CLEANER 50 on locomotives from different runs. See how road dirt, oils, greases wilt under its penetrating attack. Call your Pennsalt service man for a demonstration, or write Railroad Maintenance, Pennsylvania Salt Manufacturing Company. EAST: Three Penn Center Plaza, Philadelphia 2, Pa.; WEST: Woolsey Building, 2168 Shattuck Avenue, Berkeley 4, California.

Favorite of the men in the shops . . .

Pennsalt Chemicals

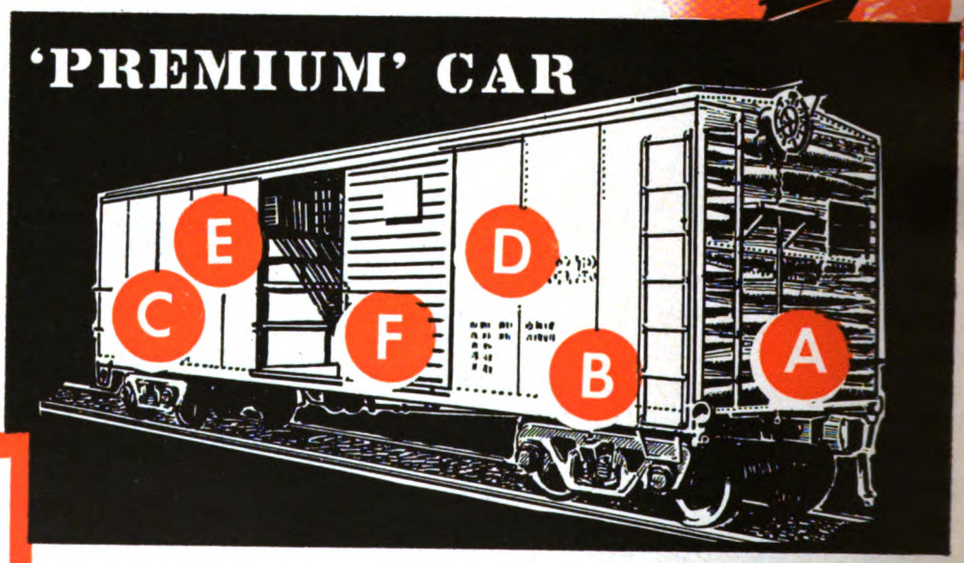
PENNSYLVANIA SALT MANUFACTURING COMPANY • Philadelphia, Pa.

*SHIPPERS SAY...

"Give us more 'Premium' cars, more cushion underframe cars... you'll get more freight!"

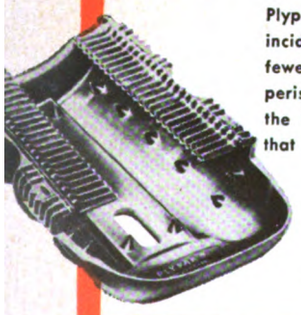
SEE Railway Age report of shippers' car preferences, in issue of October 24

Shippers' answers to the Railway Age car questionaire indicate a definite preference for cars equipped with **A** Cushion Underframes to protect lading against longitudinal shocks, **B** Improved trucks to reduce verticle shocks, **D** Wider doors to facilitate mechanical loading, and, **E** Load retainers to hold lading safely against shifting. All are features of the 'PREMIUM CAR' the coming freight car.



SPEED IS IMPORTANT WITH PERISHABLES

PLYPAKS reduce frequency of hot box delay



Plypak proven reduction of incidence of hot boxes means fewer delays in shipment of perishables. Railway Age, in the Sept. 12 issue, reports that 5000 Plypak equipped cars had 1/5 the percentage of hot boxes as compared with like cars in like service, which had no Plypaks.

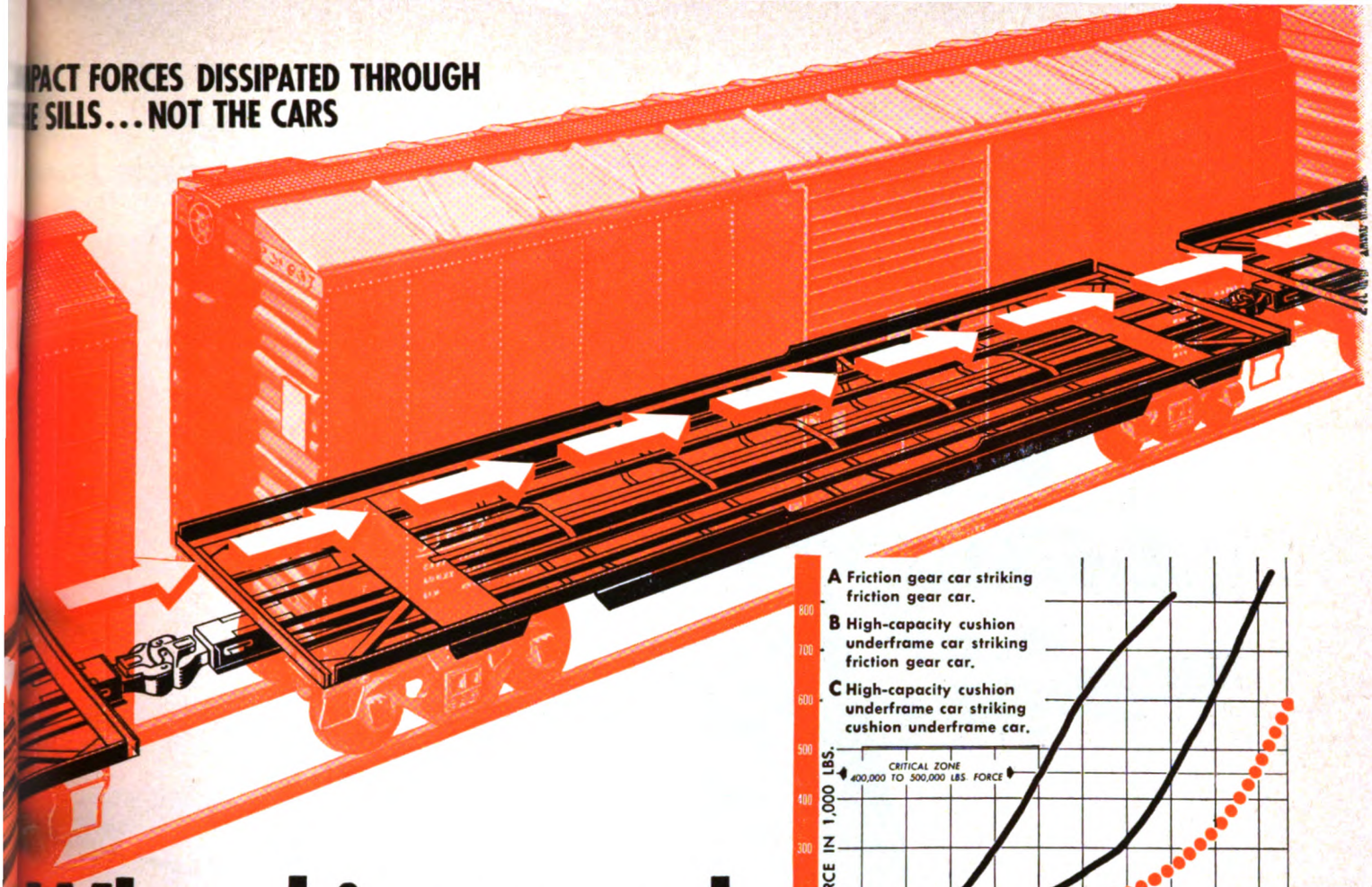
WAUGH

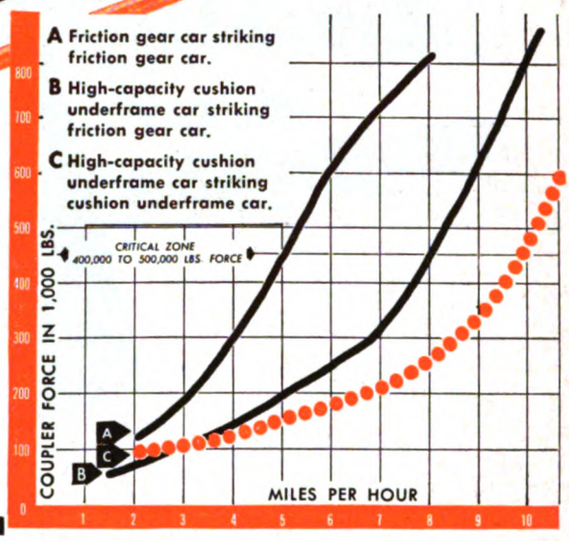
HIGH CAPACITY *Cushion*

CUSHIONING DEVICE

WAUGH EQUIPMENT COMPANY, 420 Lexington Ave.,

IPACT FORCES DISSIPATED THROUGH E SILLS... NOT THE CARS



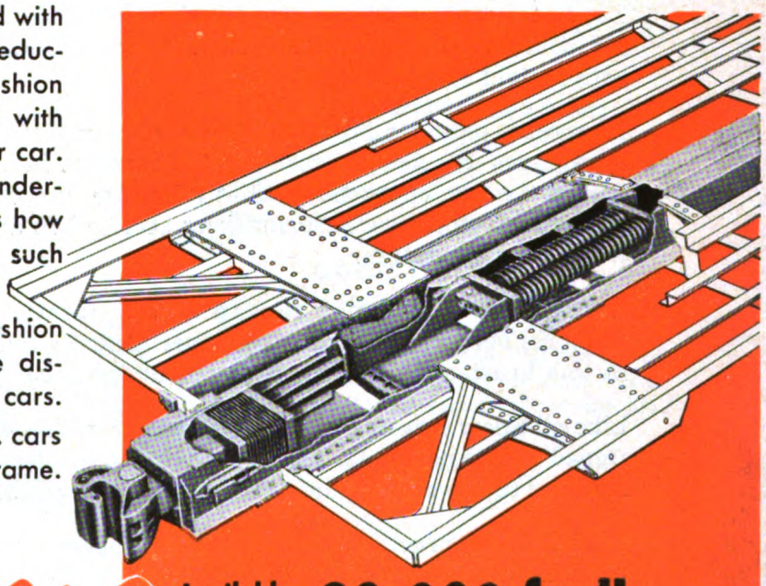


Why shippers ask for Cushion Underframe cars:

Current excessive lading damage, seemingly unavoidable with conventional cars, is reduced to a minimum in cars equipped with Cushion Underframes. In the graph (above right) note (B) reduction in transference of impact forces to the car structure of Cushion Underframe car struck by friction gear car, as compared with (A), the curve for a friction gear car striking a friction gear car. Note also (C) the far greater force reduction in the Cushion Underframe car struck by a Cushion Underframe car! This shows how the Waugh High Capacity Cushion Underframe provides such extraordinary protection for lading and cars.

In a series of cars equipped with Waugh High Capacity Cushion Underframes the protection is increased since forces are dissipated successively through the *sills . . . not* through the cars.

For more premium traffic, specify 'PREMIUM CARS'. . . cars equipped with the Waugh High Capacity Cushion Underframe.



Underframe

OF THE 'PREMIUM' CAR

Available capacity 90,000 ft. lbs.
500,000 lbs. sill reaction

New York 17, N. Y. Chicago · St. Louis · Canadian Waugh Equipment Company, Montreal

Here's long brush life on the long hauls

The Speer #6758 MULTIFLEX® Brush is serviced-designed for outstanding performance in high hp locomotives – both freight and passenger.

Its special, patented MULTIFLEX construction gives all the advantages of a double brush – yet it operates in a single holder. Two independent sections minimize uneven wear and reduce vibration, assuring long service life and less wear on commutators.

Another Speer exclusive feature is the vibration-proof shunt connection. It's strongly and permanently imbedded in this brush with Speer's patented tamping compound.

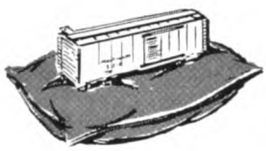
Like all Speer brushes, every detail of the #6758 was designed for its particular job. It was tested, evaluated and modified to serve heavy-duty motive units at top efficiency.

That kind of practical design makes a Speer brush the right choice for every kind of locomotive. You name your equipment – and Speer will show you high-performance brushes made specifically for your type operation.

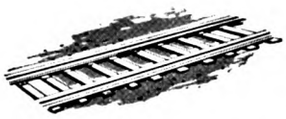
Write for your free copy of the new Speer Brush Catalog.

SPEER Carbon Co.
St. Marys, Pa.

in NATIONAL C-1 trucks VALUE is a lot of things



SOFTER RIDE
Constant pressure of the friction wedges against the bolster develops friction resistance to control vertical and lateral shocks.



LESS POUNDING OF ROADBED
Because the National C-1 truck smothers vertical and lateral shocks there is less pounding on the roadbed.

LESS MAINTENANCE
Maintenance costs are reduced because National C-1 trucks give a ride that prolongs the wear life of car, wheels, journals, bearings and roadbed.

Lading rides better on National C-1 trucks because they have an efficient constant-friction control mechanism that materially reduces vertical and lateral shocks.

The superior riding qualities of the National C-1 trucks have been proven in AAR comparative tests and further substantiated in service.

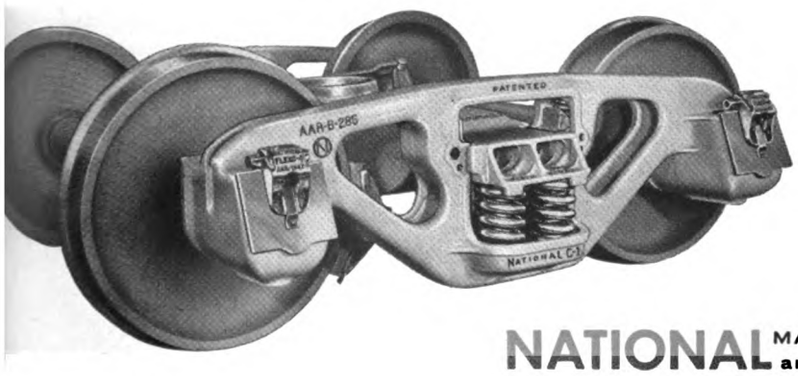
For *low maintenance* and *satisfied shippers* equip with National C-1 trucks.

AA-2381

LONG WEARING PARTS
Friction wedges, low-stressed wedge springs and hardened spring-steel wear plates are designed to last the life of the car.

FULL-WIDTH BEARING
The convex surface of the friction wedge has full-width bearing against the side frame pocket—for minimum wear.

GOOD LID FIT
Lid faces are jig-ground for smooth surface and for alignment of hinge lug and face; hinge lugs can be furnished with steel bushing and hardened steel wear plate for long life.

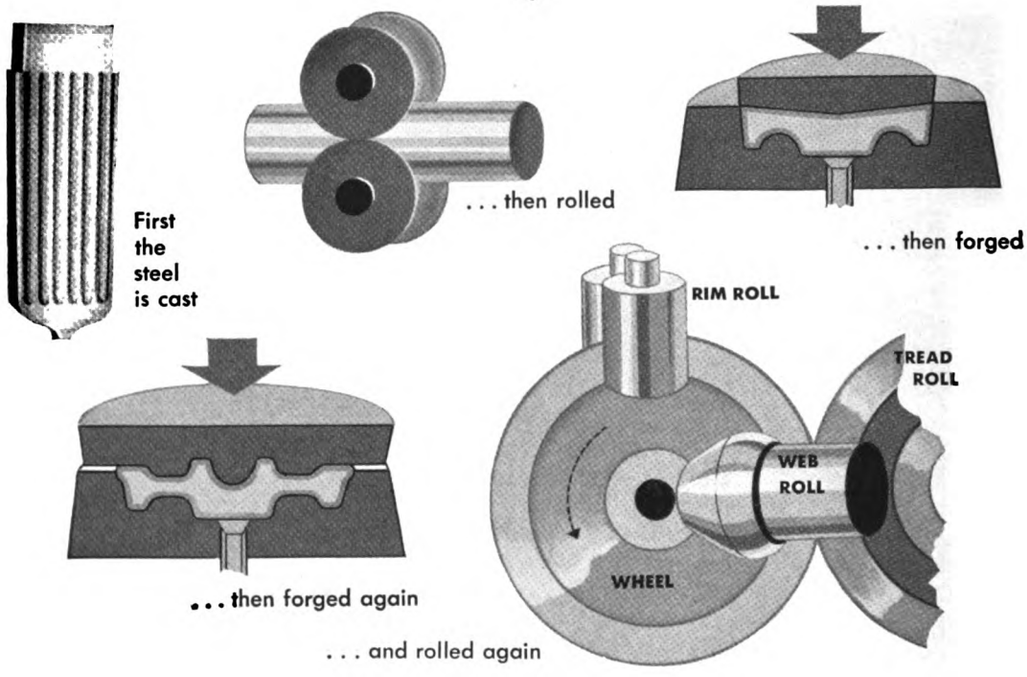


NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
Cleveland 6, Ohio

COUPLERS • YOKES • DRAFT GEARS • FREIGHT TRUCKS • SNUBBER PACKAGES • JOURNAL BOXES and LIDS

Better? Yes!

Here's Why:



Let's go behind the scenes and examine some of the steps in the making of Bethlehem wrought-steel railway wheels. It is these steps, individually and collectively, that explain why wrought-steel wheels are superior for heavy-duty service.

First of all, Bethlehem wheels are made from steel specifically melted to meet every standard of AAR specifications. The steel is cast into ingots. Then begin the various stages of "working" — a fundamental that directly contributes to strength and long life.

This "working" consists of four stages. To begin with, the cast-steel ingot is rolled into round blooms. The blooms are then sliced, and the round blocks receive two forgings in high-capacity presses; they have now become wheel blanks. After the second forging, the blanks are placed in a mill and further worked as tread, rim, and web are thoroughly rolled. Each of these steps helps to improve the properties of the finished wheel.

These are some of the reasons why Bethlehem wrought-steel wheels have stood the test of time. Railroads all over the country have adopted them for unlimited application and interchange. For many years Bethlehem has been making AAR-approved railway wheels; for freight cars alone we have furnished more than 2,000,000. This total is constantly growing, together with the large numbers supplied for passenger and diesel service.

Could there be any better evidence of quality—of conscientious workmanship?

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

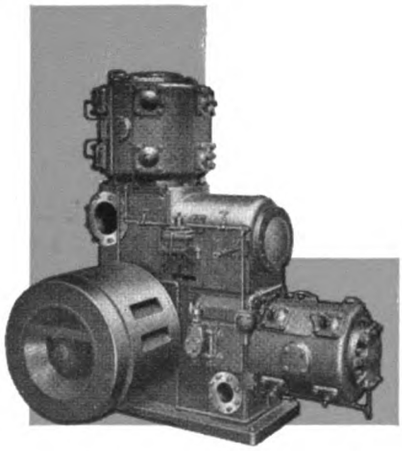
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

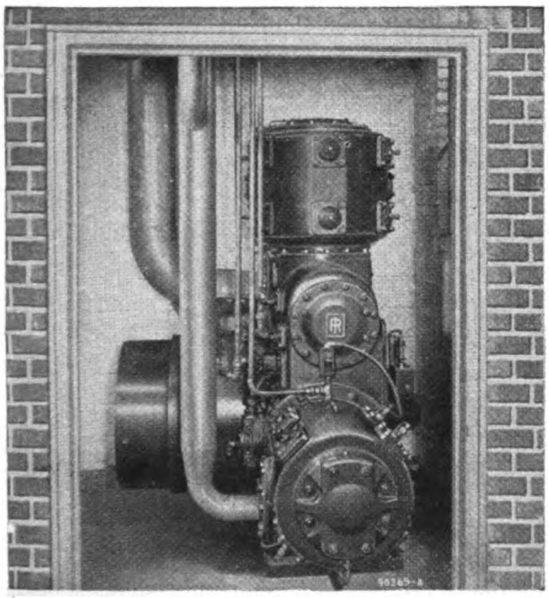
BETHLEHEM WROUGHT-STEEL WHEELS
COMPANIONS TO BETHLEHEM FORGED-STEEL AXLES
FREIGHT • PASSENGER • DIESEL

BETHLEHEM STEEL

MORE AIR POWER in less floor space

That's one of the many advantages offered by this space-saving XLE *compressor:*





A bronze company squeezed this XLE into a small, unused storage room.

Packaged design for minimum floor space, and specially balanced for minimum foundation... ideal for skid-mounting.

Easy to operate... push button starting, grouped controls, automatic force-feed lubrication, automatic condensate removal, automatic air-operated starting unloaders and capacity control.

Easy to install or relocate... ready-to-run, assembled shipment ... simplified air and water piping.

Easy to maintain... simplified long-life construction... full-floating, cool-running, aluminum-alloy bearings that require no adjustment... no need to open the sealed crankcase which stays clean inside... streamlined exterior also easy to keep clean.

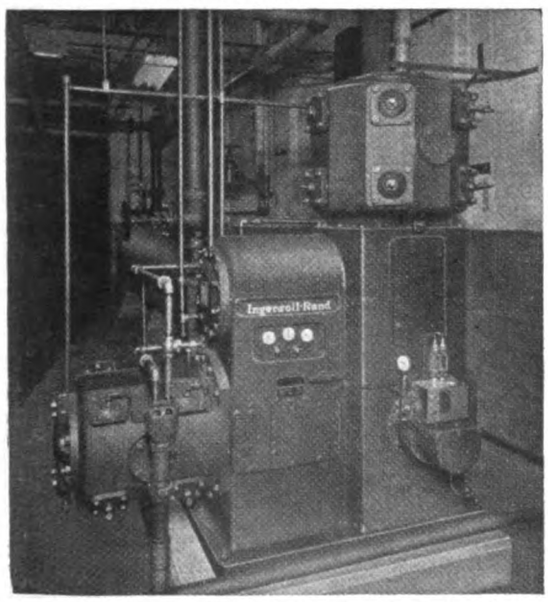
Low operating costs... new high-efficiency, long-life I-R Type A Channel Valves result in compressor efficiency comparable to the largest units... durable, high-efficiency tube-and-fin intercooler saves water... efficient direct-connected motor.

Built for reliable, continuous full-load service... sizes 125, 150, 200, 250, 300, 350 horsepower... discharge pressures 80 to 125-psi, two stage... write for more information today.

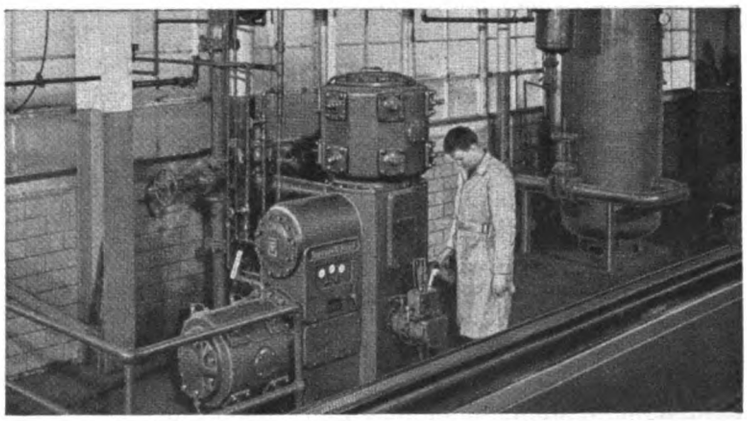
Ingersoll-Rand

1-105 **11 Broadway, New York 4, N. Y.**

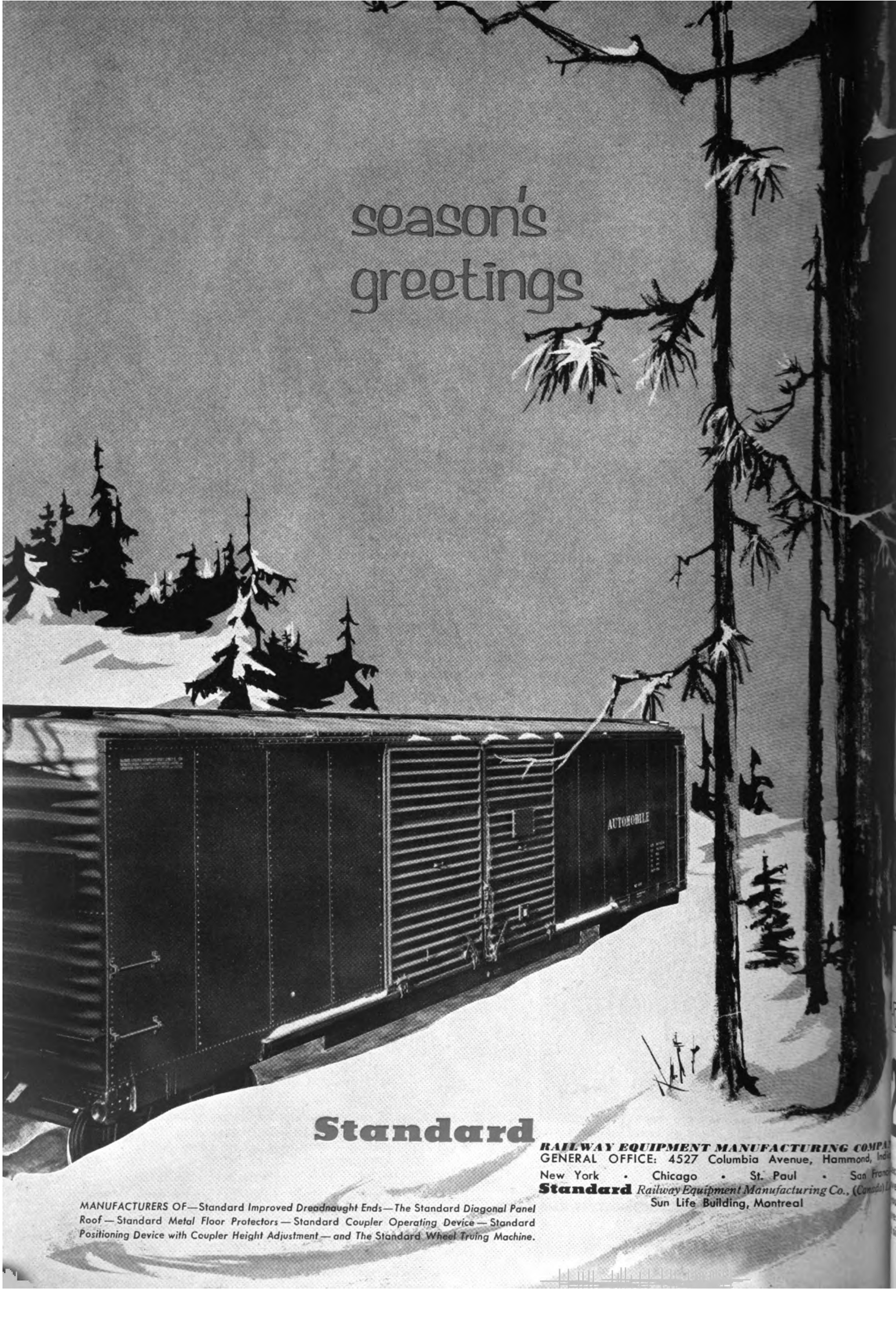
COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS
DIESEL AND GAS ENGINES



A safety-razor manufacturer found plenty of space for this XLE installation in a screened-off basement corner.



And here's a compact, space-saving installation of an XLE compressor, aftercooler and air receiver in a tool plant

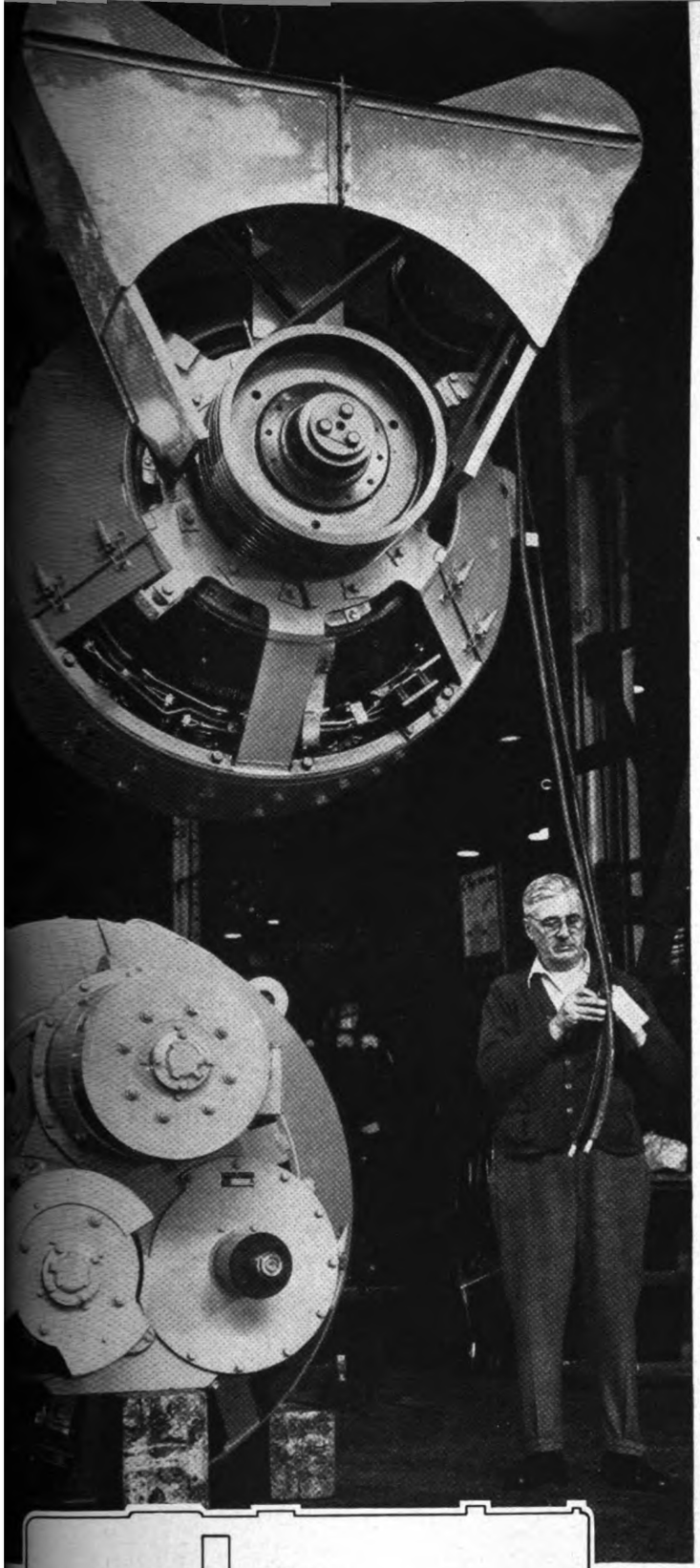


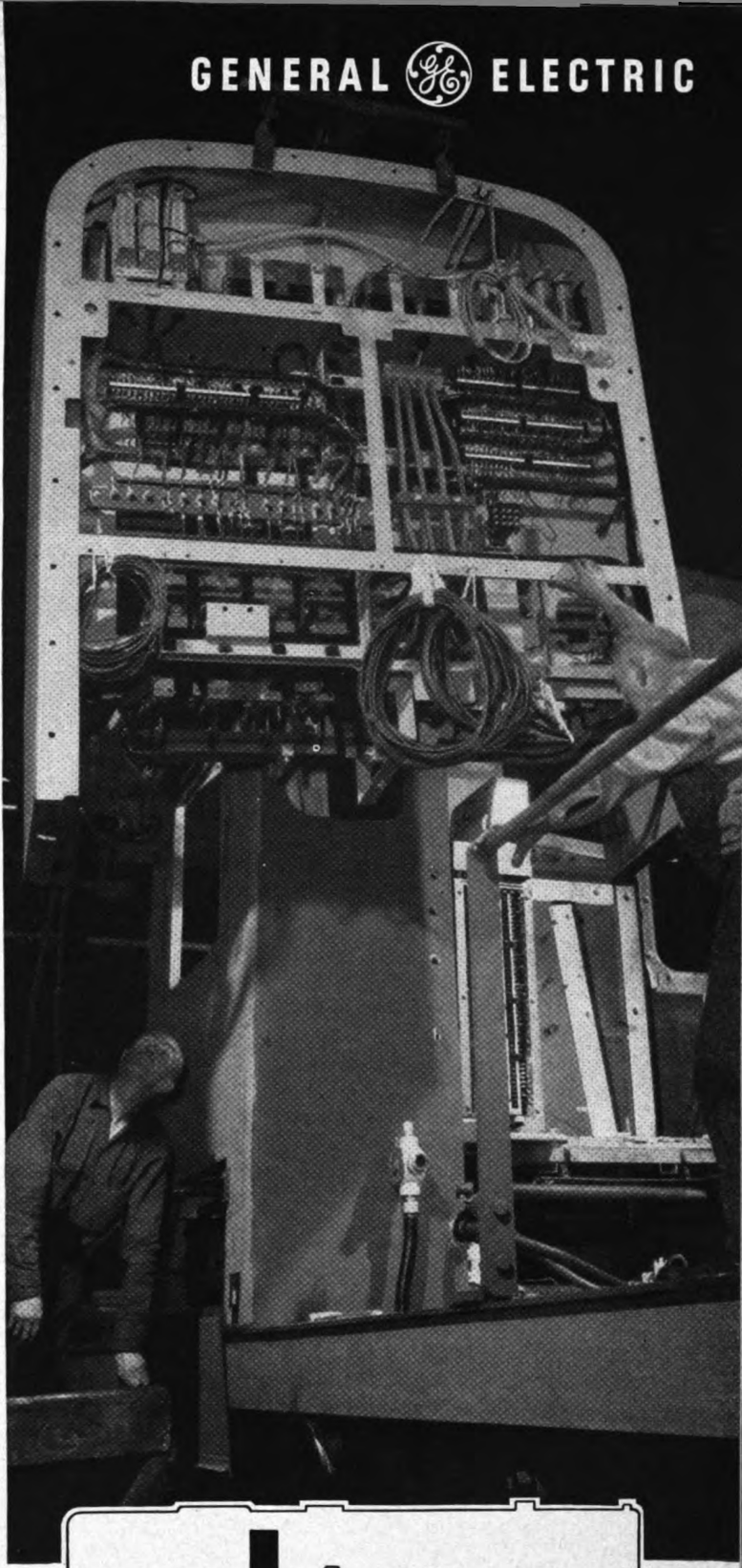
Standard

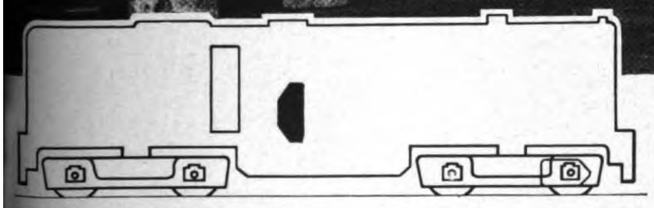
RAILWAY EQUIPMENT MANUFACTURING COMPA
GENERAL OFFICE: 4527 Columbia Avenue, Hammond, Indi
New York • Chicago • St. Paul • San Fran
Standard *Railway Equipment Manufacturing Co., (Canada) L*
Sun Life Building, Montreal

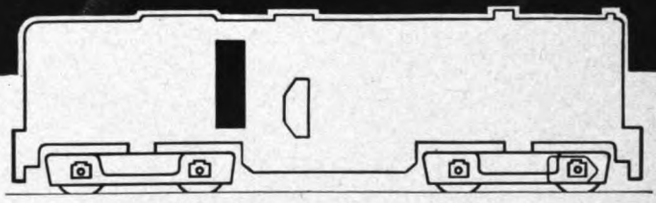
MANUFACTURERS OF—Standard *Improved Dreadnaught Ends*—*The* Standard *Diagonal Panel Roof*—Standard *Metal Floor Protectors*—Standard *Coupler Operating Device*—Standard *Positioning Device with Coupler Height Adjustment*—*and The* Standard *Wheel Truing Machine.*

GENERAL ELECTRIC









2 G-E TRACTION GENERATORS ARE BUILT TO REDUCE LOCOMOTIVE ROAD FAILURES

Because they are designed specifically to take flashovers in stride, G-E traction generators help protect your locomotive from frequent and costly road failures. In most cases, if a G-E generator flashes over, it simply recovers and the locomotive continues its run.

3 G-E CONTROL REQUIRES MINIMUM MAINTENANCE BETWEEN ANNUAL INSPECTIONS

G-E control is simple in construction, with fewer moving parts than other systems. In actual railroad service, locomotives equipped with G-E control have operated from annual inspection to annual inspection without a single detention being charged to the control system.

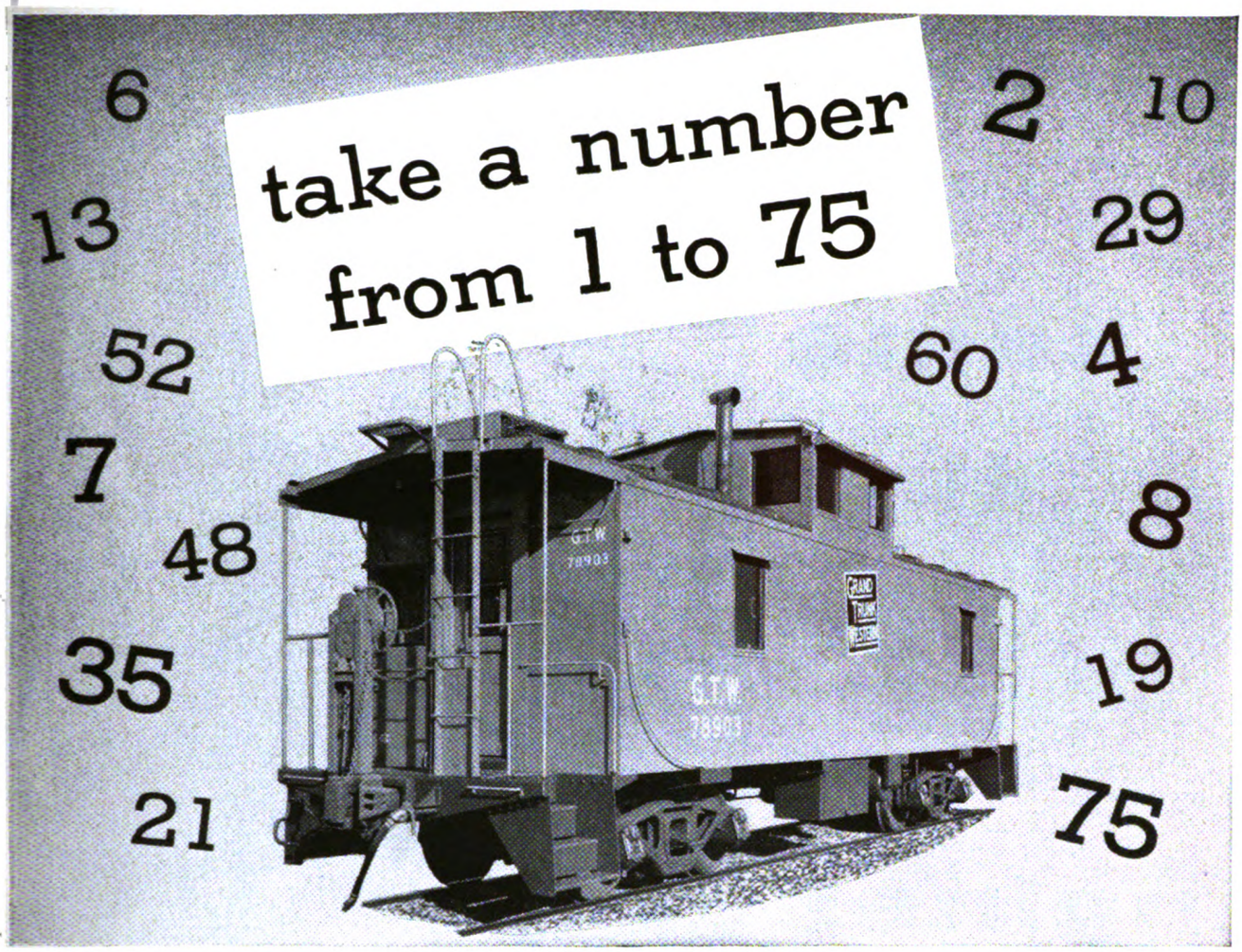
For straight, round, concentric wheel bores and more wheels per hour..

BETTS
car wheel

Betts Car Wheel Borers are top-quality, high-production machine tools designed for an all-important railroad job!

CONSOLIDATED MACHINE TOOL

A DIVISION OF FARREL-



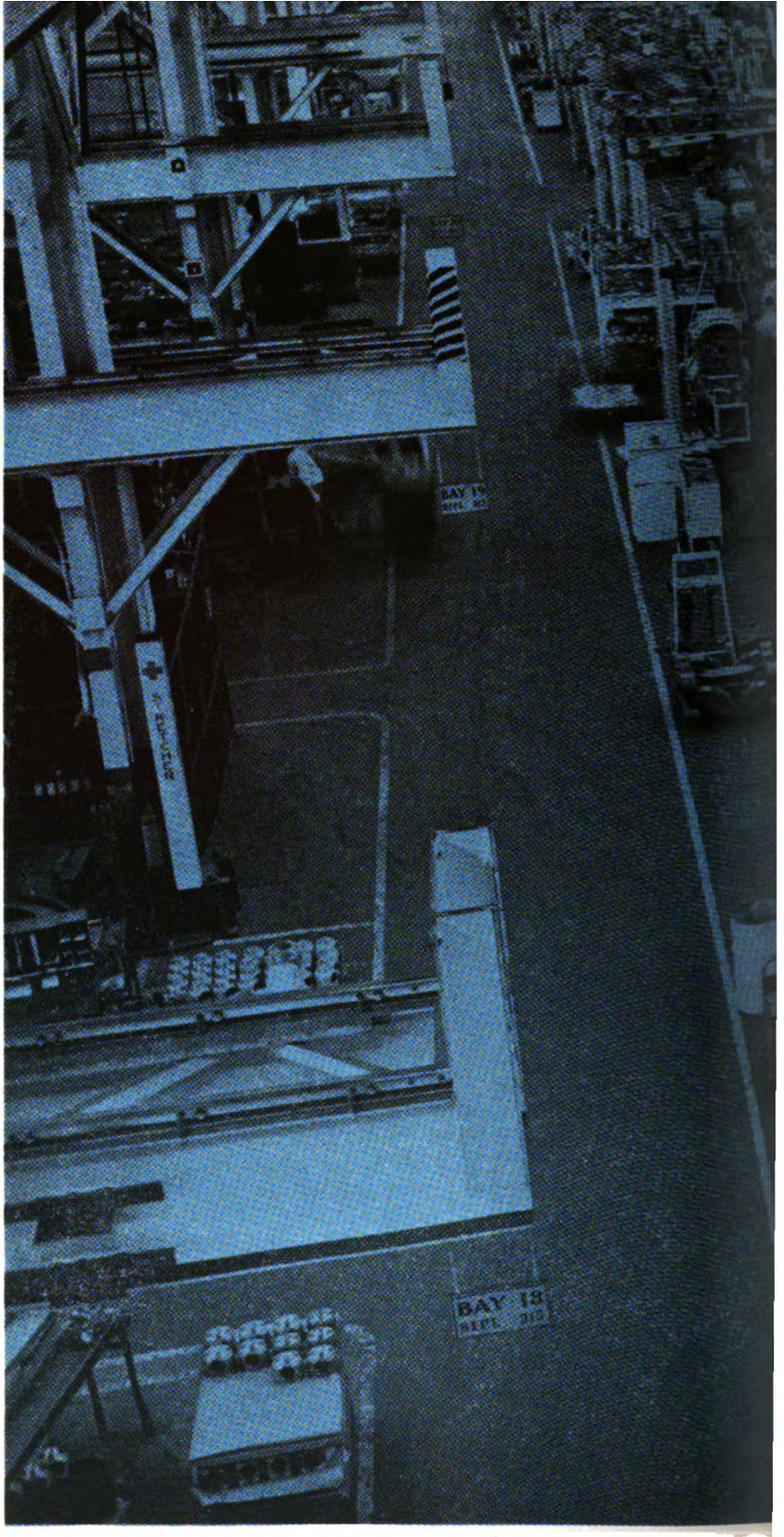
International builds cabooses in any quantity — with economy and speed. During the past five years we have filled numerous orders for single cars with the same service and attention as orders for 50 and 75. Orders for 1, 2, or 3 cars are no problem to us. They are constructed as additions to whatever large order may be in the shops at the time — with resultant economies all 'round. Small roads with limited caboose requirements — and larger roads that would replace out-moded cabooses on an extended program — will discover International can build to suit your railroad's exact interior needs, without penalty for small quantities.

International RAILWAY CAR CO.

General Offices: 814 Rand Bldg., Buffalo, N. Y.

Down the same line with new engines

—and every one we remanufacture for unit exchange carries the same warranty as new



A GOOD percentage of the Diesels you'll see on our production line these days are 567's that have come back for upgrading to include many of the latest "C" engine features.

Railroads are finding it pays to take advantage of this Electro-Motive modernization service because:

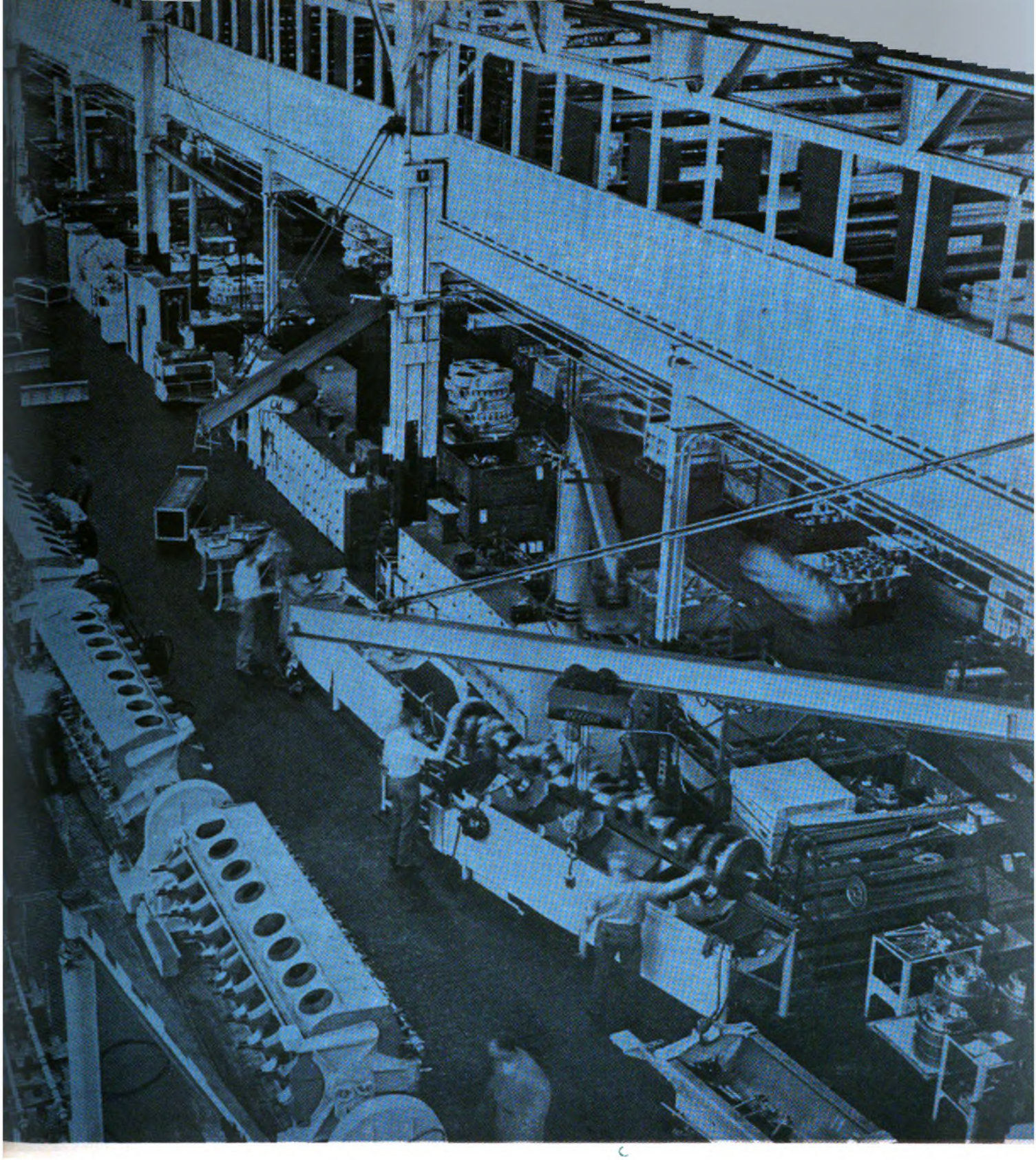
(a) Upgrading of the engine pays for itself in direct maintenance savings in four years or less.

(b) Horsepower can be increased up to 17%—enabling the locomotive to pull more tonnage—with substantial savings in train-miles.

(c) Lower costs are assured by Electro-Motive's policy of bringing to *remanufacture* the same production-line efficiencies and economies developed in original manufacture.

(d) Every engine remanufactured and modernized by Electro-Motive carries the same performance warranty as a brand-new unit.

When the miles are run out on an engine, generator,



traction motor or other major locomotive assembly, that's the time to order "Unit Exchange."

You receive immediate shipment of a fully modernized unit, F.O.B. our nearest Factory Branch, and then trade in your old unit. The cost of the exchange is determined by the condition of the old assembly you trade in—*and is usually less than half the price of a new unit!*

Write us or consult your local Electro-Motive representative if you'd like more information on this moneysaving "Unit Exchange" service.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

GENERAL MOTORS

La Grange, Illinois — Home of the Diesel Locomotive. *9 regional warehouses and Factory Branches to serve you*

Engine remanufacturing service at La Grange, Halethorpe, Jacksonville, Salt Lake City and Los Angeles

Here's why FREIGHT SOLID JOURNAL

It's not just a question of low initial cost: you also choose solid-type bearings because they offer the utmost in load capacity, protection for lading, ease and simplicity of maintenance and many other advantages. They all add up to a BIGGER NET RETURN per car dollar invested.

SURE, you get up to 10% more cars for your money, up to 10% more car availability, and hence more freight revenue per car dollar invested with low-cost solid bearings. But there are many other inherent advantages, too. Let's take a quick look.

1. Unrestricted as to Speed and Load

Steel, stone, ore — you can take the biggest loads with solid bearing cars — sometimes up to 20 tons per axle. But solid bearings reduce these maximum loads to about 700 pounds per square inch — well within bearing capacity. Compressive strength of the babbitt at highest normal temperatures is over 7200 psi. With oils of adequate film strength and stability you can always operate solid bearings with loads up to axle capacity.

What about speed? Oil film pressures increase with speed. You get a thicker film of oil that more than compensates for any viscosity change. Oil film thickness is the criterion of solid bearing safety. With solid bearing cars you're actually better off in the higher range of freight train speeds.

2. Ease and Simplicity of Maintenance

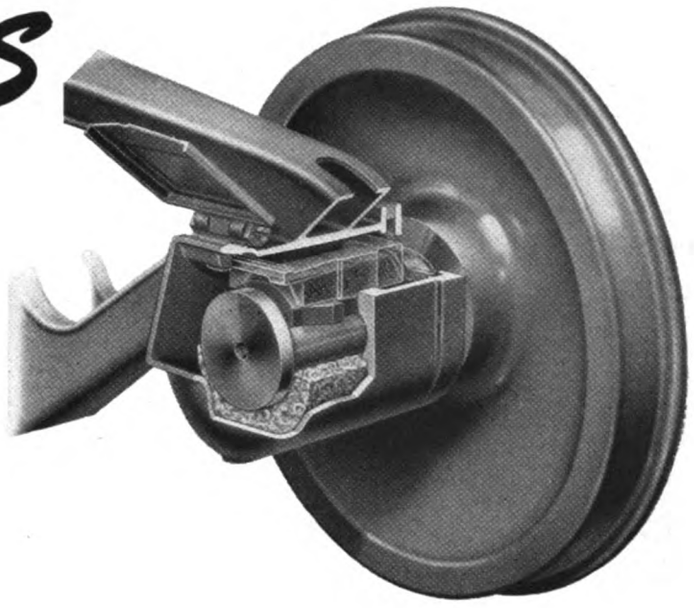
The AAR journal bearing assembly is a simple standard. Internal parts can be easily inspected or removed — without special tools or equipment, with the minimum of effort and time.

There's no need for expensive shop facilities and no skilled labor is required. Stocking of parts is simple and replacements are always available at any repair point of any line in the country. Moreover, it has been demonstrated many times that all labor and material costs for solid bearing maintenance come to less than the fixed charges alone (interest and depreciation) on the extra investment required for expensive roller-type bearings.

3. Greater Protection for Lading

With solid journal bearings lading gets the smoothest possible ride on standard freight car trucks. That's because solid-type bearings cushion lateral shocks and vibrations. There's ½" free lateral movement of the bearing on the journal, and lateral shocks are flexibly controlled—not rigidly opposed.

CARS NEED BEARINGS



This simple, standard solid journal bearing assembly is the most practical, most economical type of freight car bearing obtainable. What's more, there are low-cost means for improving it still further, without departing from the inherent advantages described below. That's why solid bearings are *right* for railroads—in performance and in cost!

This means less wear and tear on car bodies, trucks, wheel flanges and rails, too!

4. Weight and Resistance Advantages

In motion the solid bearing glides on a film of oil like a skater on ice. Dynamic resistance of solid bearings is as low or lower than that for any other type of bearing — averages less than one pound per ton regardless of the outside temperature or speed of operation.

Solid bearings also save many tons excess dead weight on every moving train. Lighter weight, plus lowest possible resistance in pounds per ton, puts the maximum tractive effort of the locomotive to the business of moving goods.

You need less horsepower hours of energy to move a train from A to B when cars are solid-bearing-equipped.

5. Improved Dependability in Freight Service

Solid bearing performance is getting better all the time. In 1954, there was only one set-off for every 15 cars — equivalent to each car operating 15 years per road failure of a bearing. And this average car was almost 20 years old. You can bet that other bearing types would have a tough time trying to beat that record.

Better still, the means are now available to reduce journal box servicing requirements and get still better solid bearing performance. Periodic servicing—on a calendar basis—and 3-year repacks are just around the corner. Improved bearings and lubricators are now being installed. Bearing and dust guard life will probably be doubled.

You save money in many ways with solid bearing cars, and you will save even more in the future. With so many inherent advantages, you just can't beat solid-type bearings for railroad rolling stock!

Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

MAGNUS

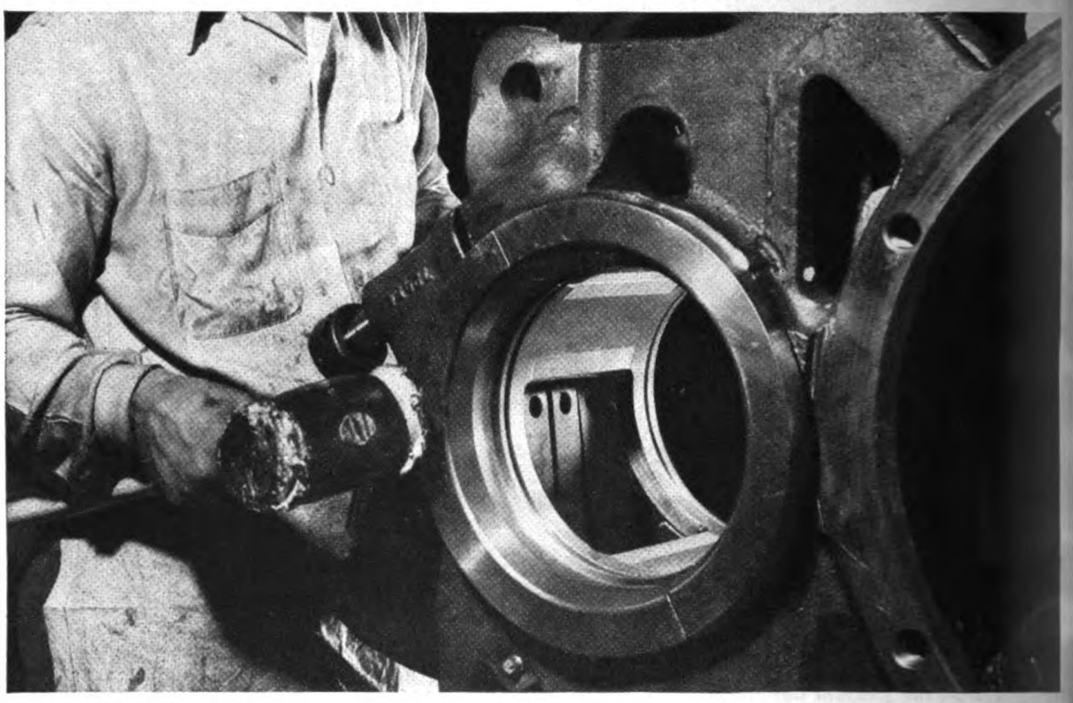
Solid Bearings

MAGNUS METAL CORPORATION

Subsidiary of **NATIONAL LEAD COMPANY**

7 G-E replacement parts for better locomotive operation

1. G-E MOTOR SUSPENSION BEARINGS with *oil-return* grooves can save you up to $85.00 for each locomotive unit annually.



How G-E Motor Suspension Bearings Give Long Life, Low Maintenance Costs

With General Electric's *oil-return* traction-motor suspension bearings, a passenger unit, averaging 20,000 miles per month, is capable of reducing oil consumption approximately 220 gallons per year. It's accomplished by *oil-return* grooves cut into the bore at each end of the bearing. Through these grooves excess lubricating oil is *returned* to the axle-cap—not onto the roadbed.

In addition, G-E suspension bearings are ideal for high-speed railroad service. Their special alloy composition resists breakage and wear under today's tough operating conditions. Their rigid construction, which helps keep them tight in the axle-caps, means still less wear on bearings and traction-motor gearing.

To get the performance you originally bought, always specify genuine General Electric traction-motor suspension bearings—the bearings that are designed as an integral part of your G-E traction motor. General Electric Co., Locomotive & Car Equipment Dept., Erie, Pa. 128-23

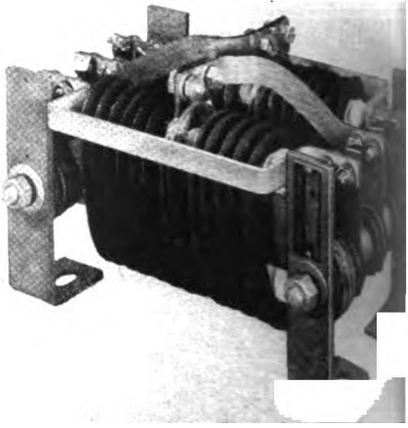
Progress Is Our Most Important Product

GENERAL ELECTRIC

2. G-E RECOMMENDED CARBON BRUSHES are selected for the proper degree of hardness and grain structure to minimize wear and tear on commutator surfaces of your unit.

3. G-E GEARING is designed and quality-control manufactured to carry the heavy starting loads and take the running shock loads encountered in today's heavy railroad service.

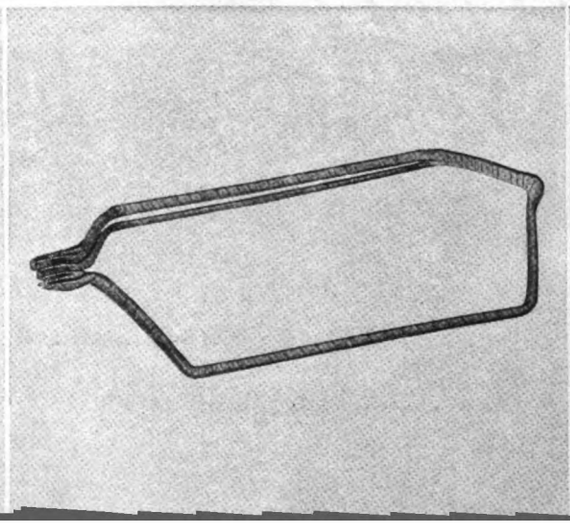
4. G-E RESISTORS have floating steel backbones that expand and contract freely with high temperature changes and therefore are not subject to harmful buckling forces.

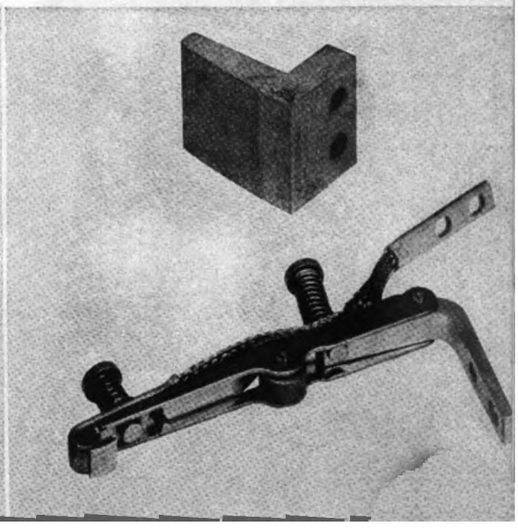


5. **G-E COMMUTATORS** retain smoothness in rigorous service because high-speed, high-temperature seasoning process sets segments firmly in place, cuts down friction wear and tear.

6. **G-E ARMATURE COILS** are available as part of complete rewind kits for your convenience. Every coil is dimensionally accurate and quality insulated for longer life.

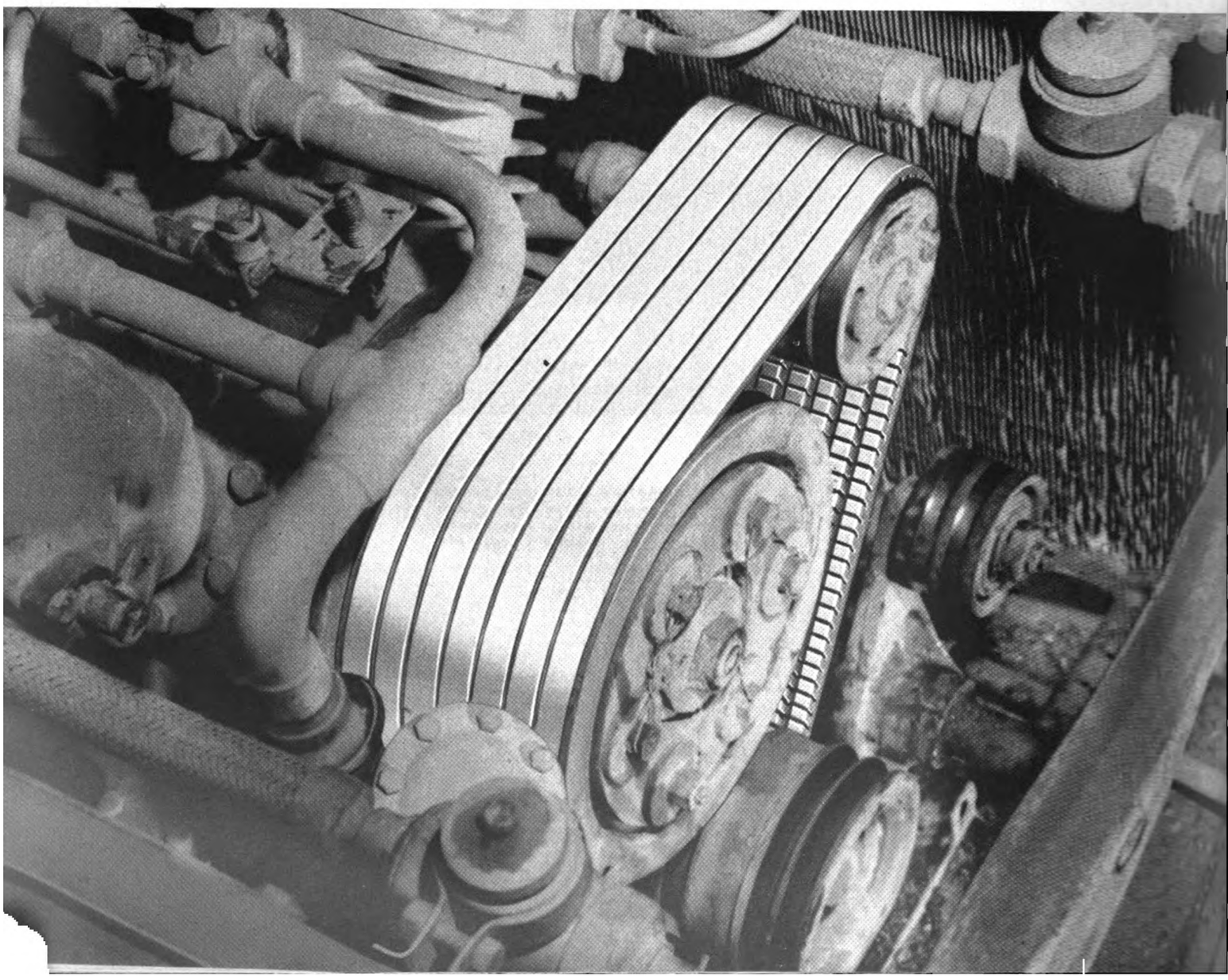
7. **G-E CONTACT PARTS** break circuits quickly with a minimum metal transfer. This assures you of long service life from these parts.



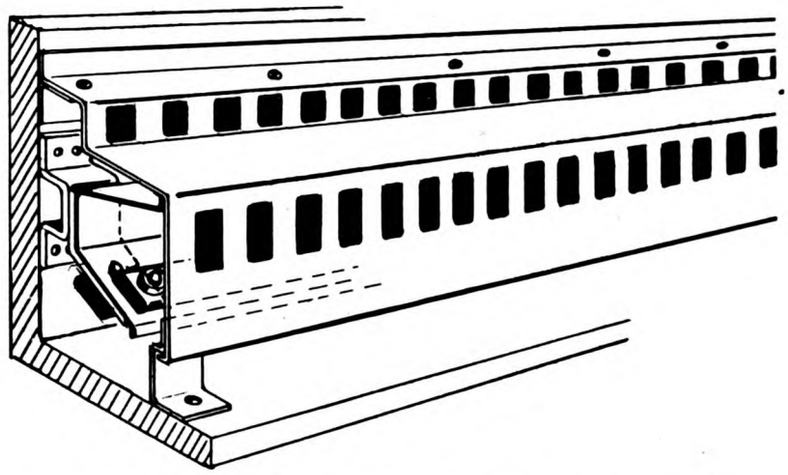


Dayton Cog V-Belts are ruggedly built of special materials processed to withstand the punishment of tougher railway service.

Major railroad cuts drive costs in half with



NEW IDEA in passenger car heating . . . OGONTZ *Convectair* DESIGN prevents dangerous hot heater guards

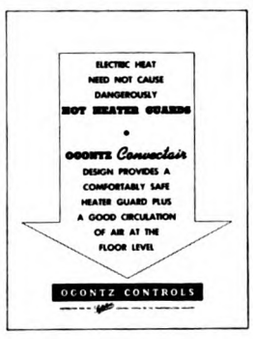


A TOO-COMMON PASSENGER COMPLAINT, when the heat is on full blast, is that of uncomfortable and dangerously-hot heater guards. The remedy? A new idea in car heating — Ogontz-design *Convectair* guards which produce large air movement to keep guard temperatures at safe levels, without lowering heating efficiency.

Comparison tests show that for a given heat input, the *Convectair* remains up to 40% cooler than a guard of conventional design. Other *Convectair* advantages:

- Suitable for steam or electric systems
- Fits existing cars
- Provides all the floor heat needed
- Makes window seats more comfortable

Any new car or car modernization program is incomplete without full consideration of Ogontz *Convectair* heater guards. Ask for the whole story.

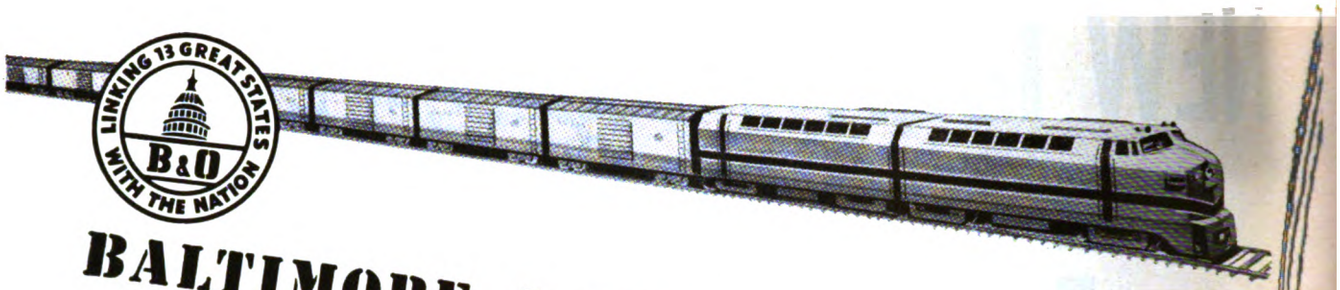


Send for Bulletin 1155 giving test results comparing *Convectair* with conventional heater guard temperatures at all levels of heat input. Ask about other Ogontz specialties: Automatic temperature, pressure, steam, air and water controls; hot water systems; automatic heating and air conditioning control systems; high current capacity heating and cooling thermostats; automatic steam heating control systems.

OGONTZ CONTROLS COMPANY

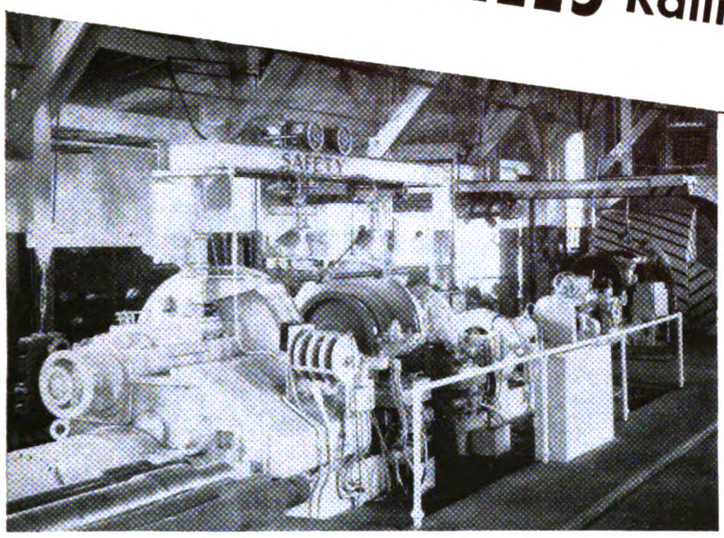
DISTRIBUTOR FOR THE Sylphon CONTROL SYSTEM TO THE TRANSPORTATION INDUSTRY

8029 YORK ROAD • PHILADELPHIA 17, PA.

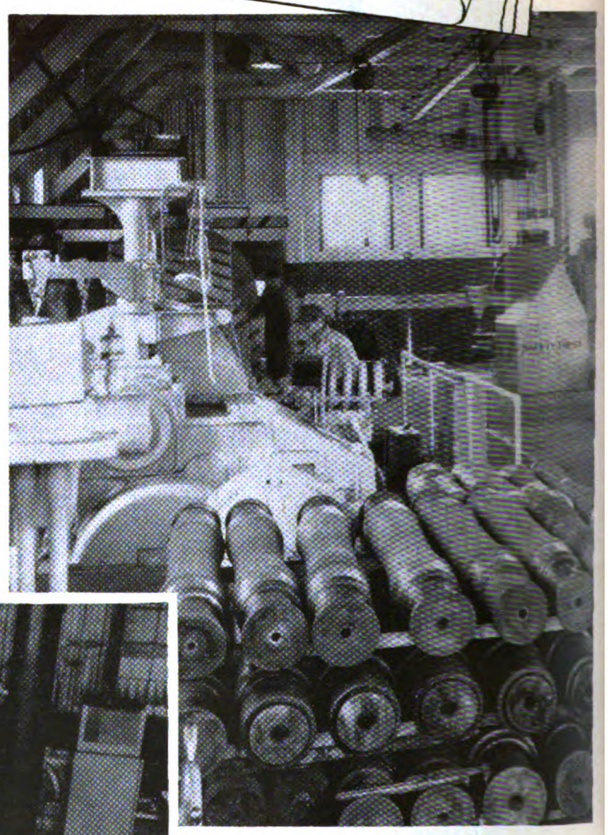


BALTIMORE & OHIO RAILROAD

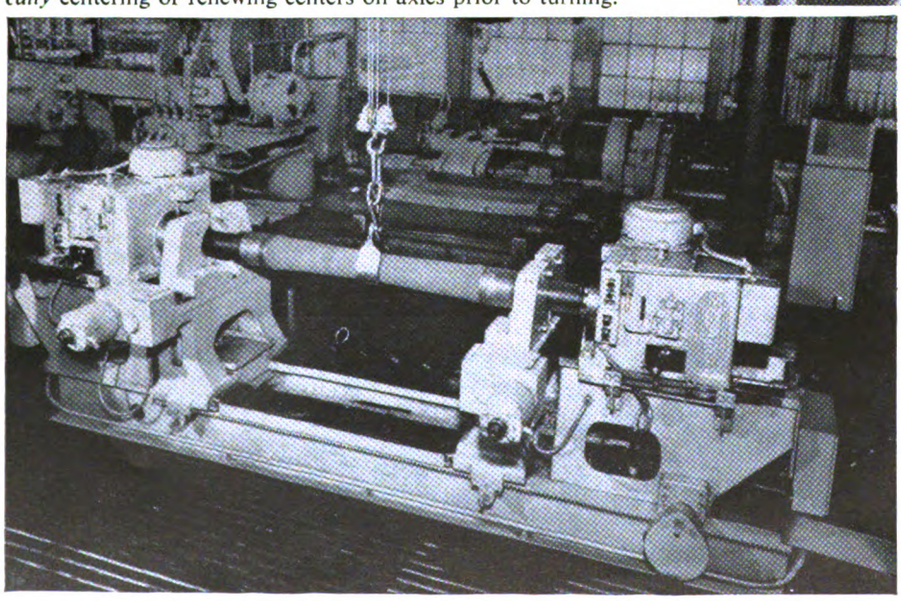
Constantly doing things—better! . . .
with modern NILES Railroad Tools



NILES 52" CAR WHEEL LATHE in the B & O's Ivorydale (Cincinnati) Shops verifies the B&O slogan "constantly *doing things*—better," by re-turning car wheels 140% faster than the lathe it replaced.



NILES HYDRAULIC AXLE CENTERING MACHINE in the B&O's Glenwood Shops assures high production and low waste by *automatically* centering or renewing centers on axles prior to turning.



BALDWIN
BLH
LIMA-HAMILTON

How Metallizing saves money in railroad shops

"Cold" metal build-up helps beat skyrocketing replacement costs—speeds maintenance jobs

Typical Railroad Metallizing Applications

Engine crankshafts, mains, throws, fits • Engine cylinders, liners, liner flutes • Water jackets, camshaft bearings • Generator, traction motor, other armature shaft bearing fits • Compressor crankshafts • Traction motor end housings • Pump rods and shafts • Eroded or corroded portions of engine blocks • Car lighting generator pulleys • Dents and scratches in car bodies

—practically any worn part repaired at only 15 to 20% replacement cost—get equipment back in service in hours, instead of days or weeks.

Some of the 28 major railroads using Metallizing:

A.T. & S.F.	Missouri Pacific	Baltimore & Ohio
New York Central	Northern Pacific	Canadian National
Atlantic Coast Line	Pennsylvania	Chesapeake & Ohio

SPECIAL RAILROAD BULLETIN AVAILABLE—Illustrates and describes a number of these time-saving, money-saving metallizing applications. Data supplied by railroads using metallizing; photographs taken in user shops. Write for copy.

METCO

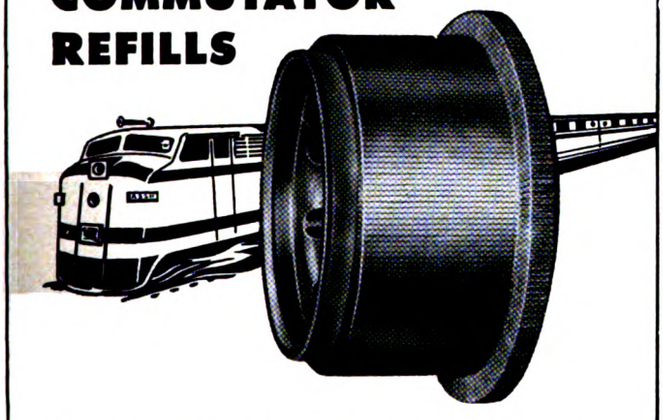
Metallizing Engineering Co., Inc.

1117 Prospect Ave., Westbury, L. I., New York • cable: METCO

In Great Britain: Telephone: EDGEWOOD 4-1300

METALLIZING EQUIPMENT COMPANY, LTD.—Chobham near Woking, England

DIESEL LOCOMOTIVE COMMUTATOR REFILLS



Expert refill work and fast service on all railroad commutators, including Diesel Locomotive Commutators. Commutators refilled by us give the best performance obtainable, as shown by their service on many of America's largest railroads. Write, wire or phone for quotations and delivery information. TOLEDO COMMUTATOR CO., OWOSSO, 3, MICHIGAN.

TOLEDO COMMUTATOR CO.

QUALITY PRODUCTS SINCE 1895

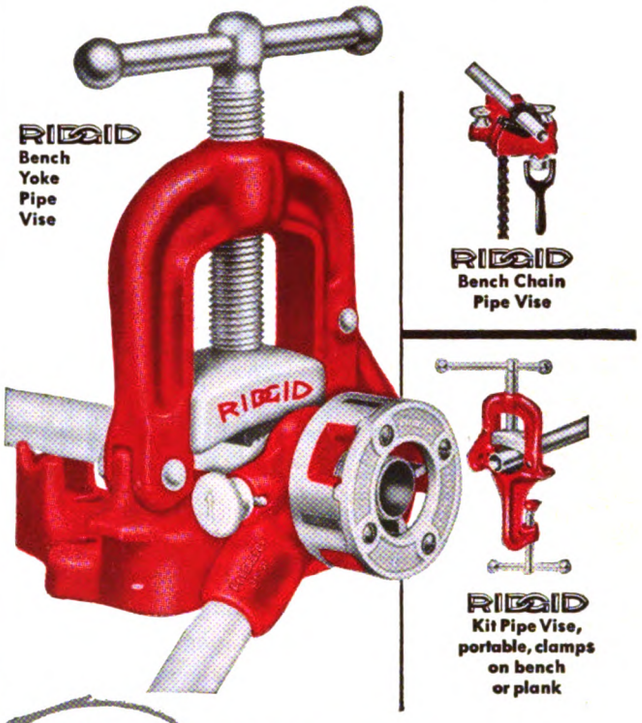
55

You get *More* for your money when it's a work-saver

RIDGID

Yoke or Chain Type

Bench, Kit or Post Pipe Vise



RIDGID Bench Yoke Pipe Vise

RIDGID Bench Chain Pipe Vise

RIDGID Kit Pipe Vise, portable, clamps on bench or plank

More **efficiency...**

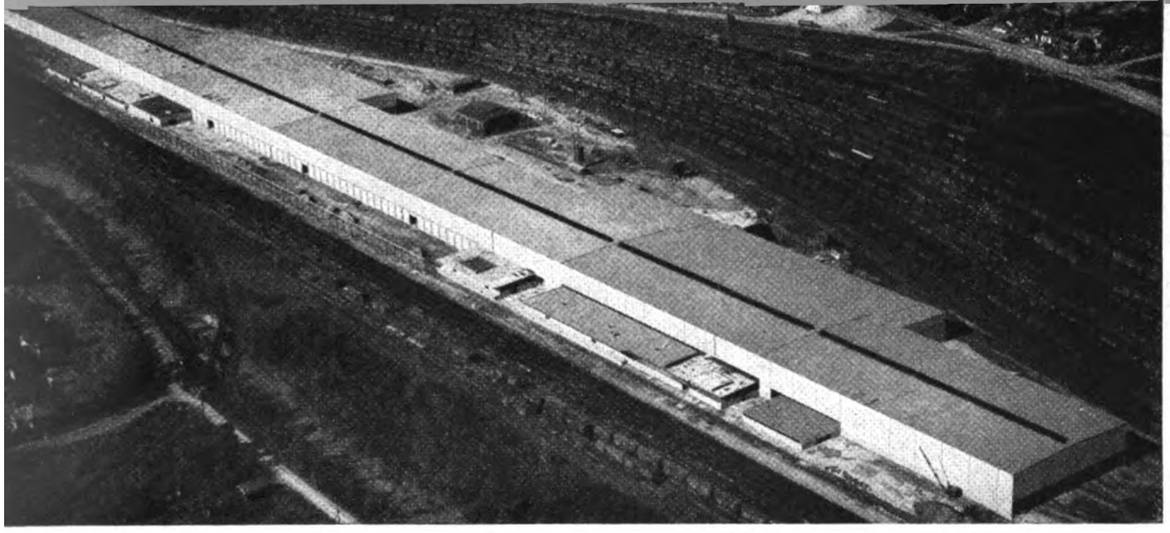
special design jaws that grip firmly . . . close and open fast . . . pipe rests for more accurate threading, easy cutting . . . handy pipe benders.

More **service...**

famous RIDGID heat-treated jaws for extra long wear . . . special malleable frames that won't warp or break . . . every vise factory tested to assure you super-performance and durability.

Get most for your money... buy RIDGID Vises, including stand and tristand, at your Supply House!

The Ridge Tool Company • Elyria, Ohio • U.S.A.



NEW, HALF-MILE LONG freight c repair shop—viewed from the air looks like the deck of a super aircra carrier. Named for the Pennsylvan Railroad's ninth president, th "Samuel Rea" will combine all repa operations under one roof.

TO HELP EASE THE SHORTAGE OF ROLLING STOCK

Pennsylvania Railroad Sets Up World's Largest Car Repair Shop, Uses G-E Power Distribution System

To help solve the present freight car shortage by getting more cars back on the road quicker, the Pennsylvania Railroad has invested in the newest and largest freight car repair shop in the world—the half-mile long "Samuel Rea" repair shop at Hollidaysburg, Pa. This new installation, which will be pressed into full service late next Spring, consolidates the repair work now being performed by the Pennsylvania at 12 different locations around the railroad. By combining repair operations under one roof and using production line methods of work, this giant four-track, steel-frame structure will have an initial capacity for rebuilding 50 cars of all classes a day. Later, by working added shifts, the capacity will be increased to 80 cars or better.

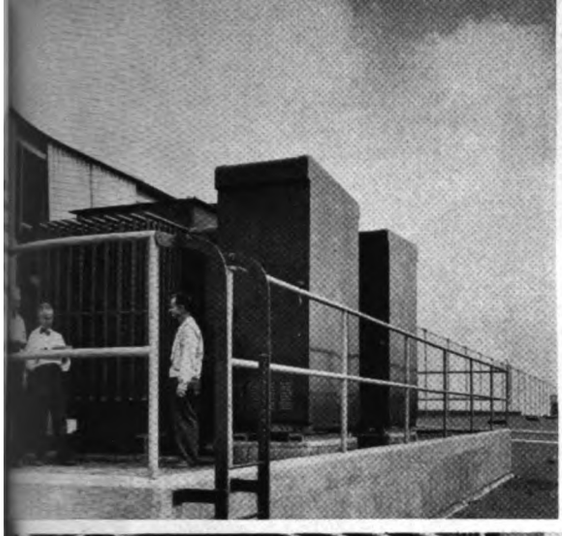
For adequate distribution of power and to protect the electrical circuits in this new and important facility, up-to-date G-E electric equipment has been installed at strategic locations throughout the huge shop. Among the General Electric equipment included in the plant's power distribution system are five outdoor substations totalling 14,000 KVA transformer capacities (together with the associated switchgear); metal-clad incoming-line switchgear units; and some 2200 KVA of dry-type transformers.

General Electric, world's largest manufacturer of electrical apparatus, has a complete line of power distribution equipment that can be tailored to fit the requirements of *any* railroad installation—*large or small.* For further information on G-E power distribution systems, call your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 152-58A

Progress Is Our Most Important Product

GENERAL ELECTRIC

WORKING CLOSELY TOGETHER, railroad officials, electrical contractor and G-E representatives planned shop's electrical system. Shown here are (l. to r.) C. J. Henry, Chief Engineer—Eastern Region, Pennsylvania R.R.; W. S. O'Sullivan, G-E switchgear specialist; W. R. Govett, Vice President and Chief Engineer, Harry F. Ortlip Co.; R. E. Nopper, G-E transportation sales engineer; and H. M. Wood, Assistant Chief of Motive Power—Cars, Pennsylvania R.R.

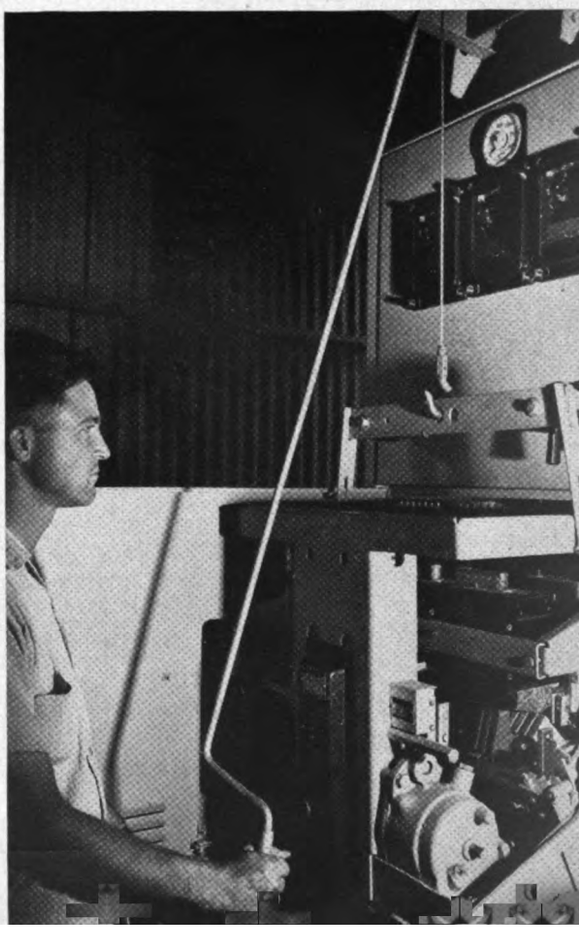


COMPACT G-E UNIT SUBSTATION, one of five installed at world's largest freight car repair shop, is double-ended with 1500 KVA of transformer at each end.

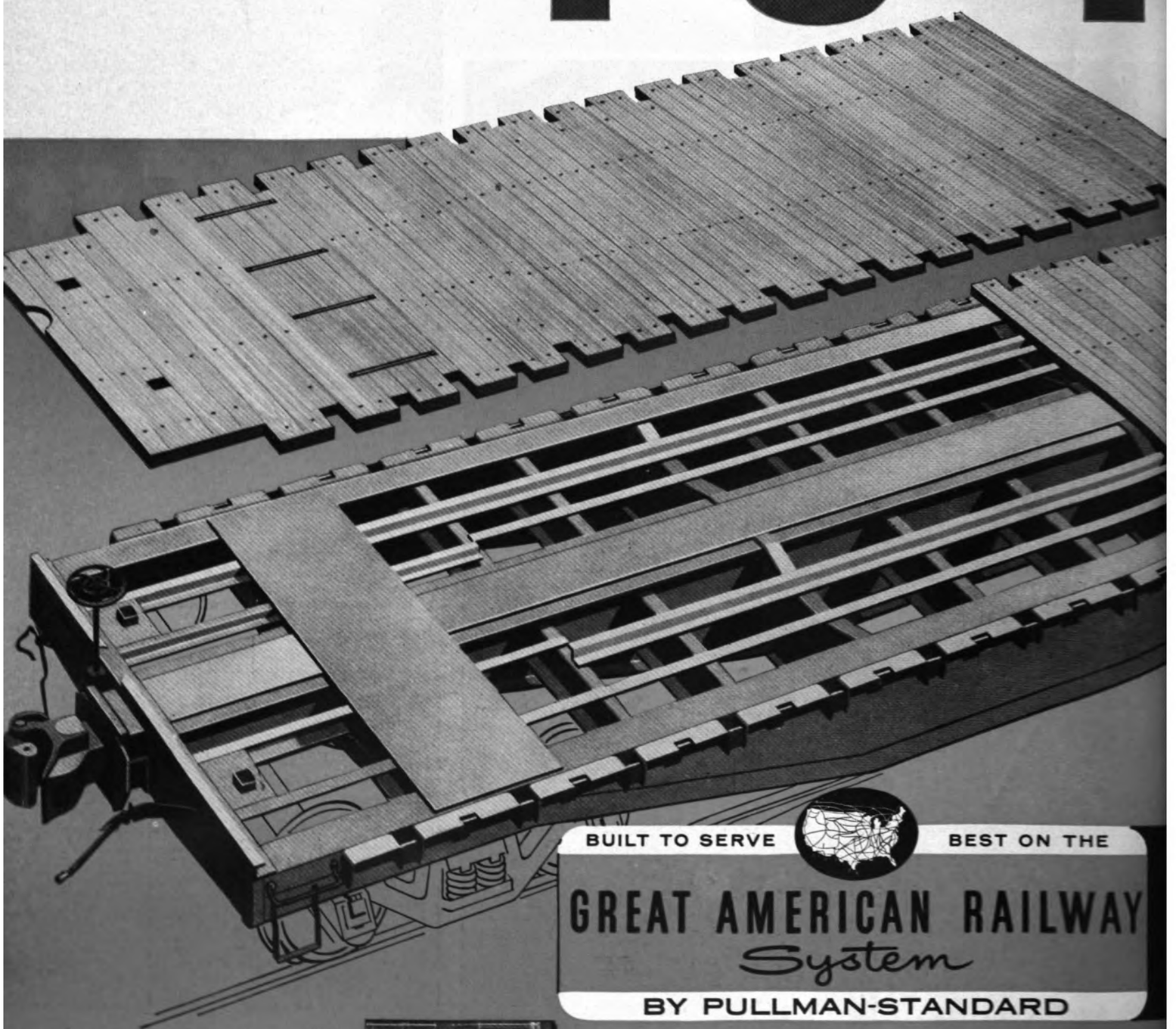
MODERN G-E METAL-CLAD SWITCHGEAR equipment in main switching station provides control and protection of the incoming power line. This type of equipment offers highest safety for personnel.

HEAVY REPAIR WORK on cars of all classes will be performed once the huge shop is readied for full operation. At present, only minor repairs are being carried out. Above, repairmen work on underside of a gondola car. In top center of photo, two G-E dry-type single-phase transformers feed power to overhead fluorescent lights.

INSIDE SWITCHGEAR ROOM of G-E substation, low-voltage drawout circuit breakers are easily inspected. Breakers fit in sturdy metal compartments as shown below.



it's new! the PS-4



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Write for your copy of Pullman-Standard's new PS-4 Flat Car brochure. It describes this new standardized freight car in detail. Your copy will be sent promptly.

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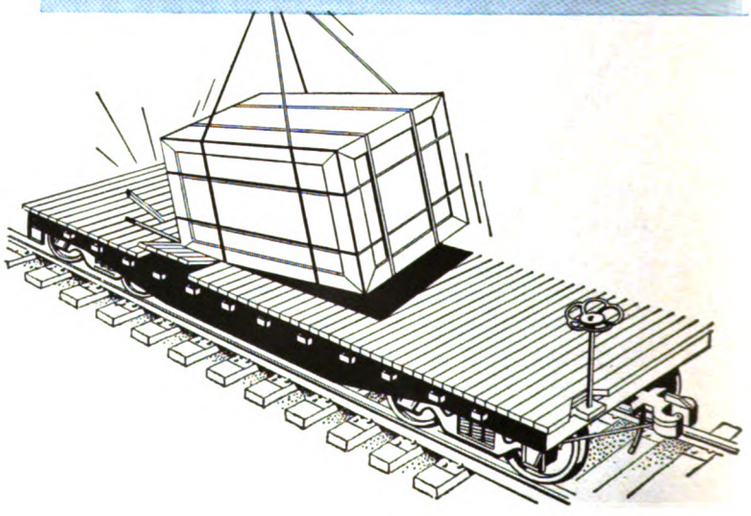
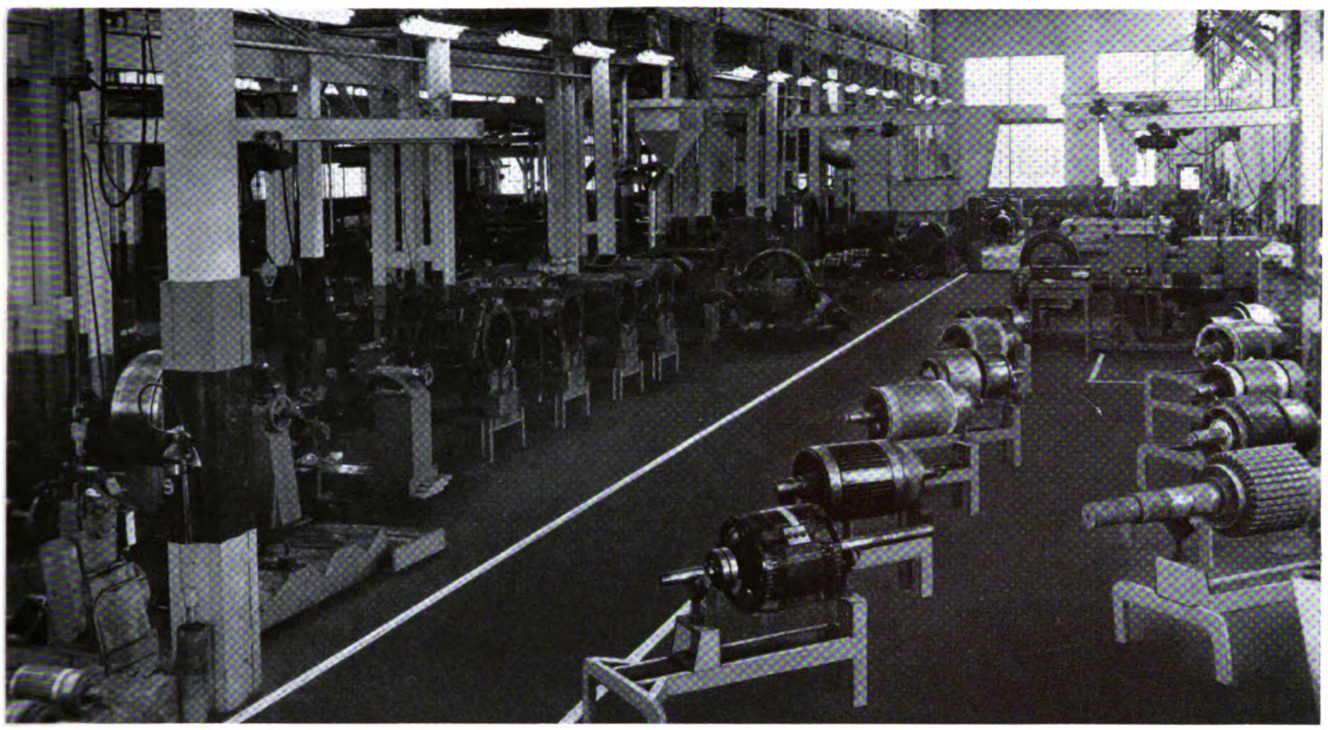
There's more here than meets the eye; almost nine-tenths of an iceberg is under water. And it's the part that's out of sight that causes the most trouble.

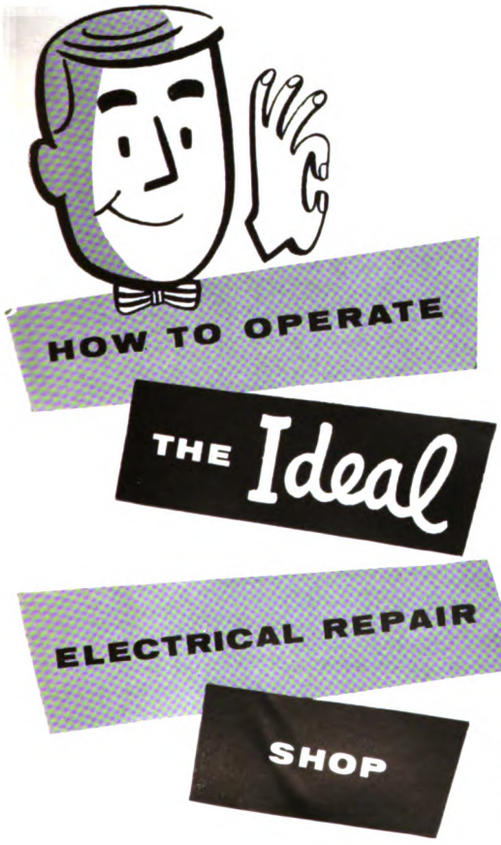
It's the same with



FREE ANALYSIS OF YOUR LUMBER PROBLEMS!

Let us analyze your lumber problems and then discuss with you the savings that can be effected by using Koppers Pressure-Treated Car Lumber on your railroad.





1 Plan your layout, equipment and payroll for the *minimum* anticipated volume. Keep men and machines busy all the time.

2 Send the jobs you can't handle without overtime to National for fast, high quality rewinding at economical prices—traction motors . . . diesel driven generators . . . auxiliary equipment such as car lighting generators.

3 To assure quality and economy in your own rewinding work make National your first source for replacement coils and rewinding supplies.

The view above shows a part of the traction motor section at National's Columbus, Ohio, plant. For more information on how National facilities like these can help you get the most from every electrical maintenance dollar, write today or get in touch with your nearby National field engineer.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

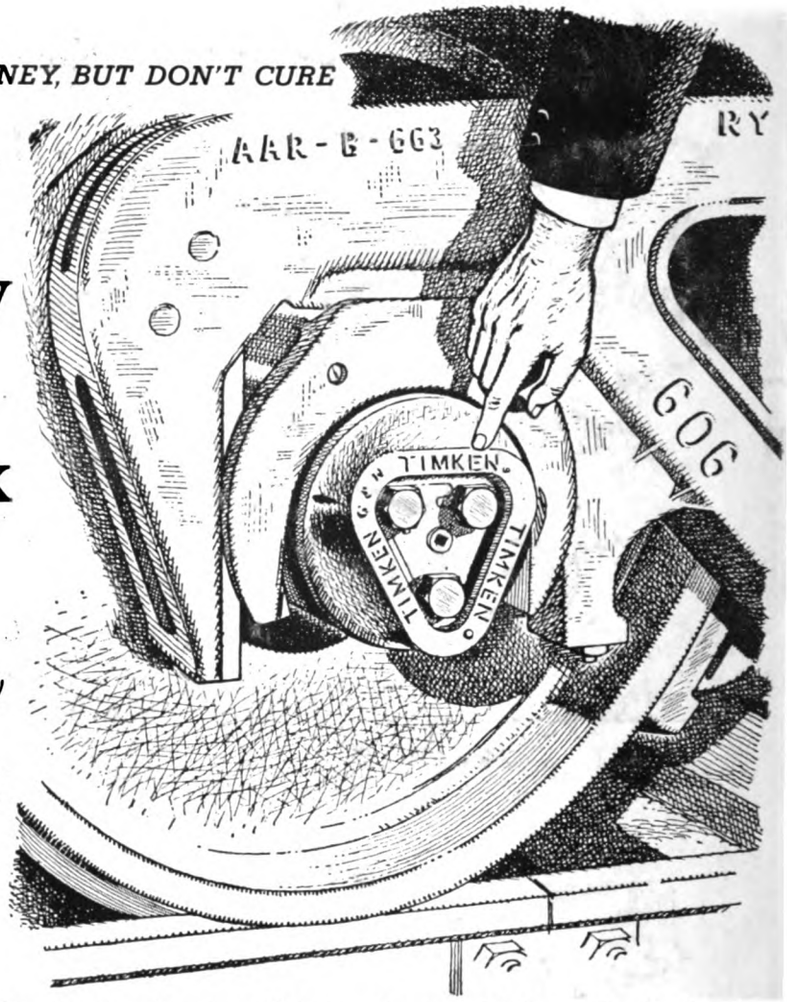
TRADE MARK

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

"CRUTCHES" COST MONEY, BUT DON'T CURE

Here's the only real Cure to the Hot Box Problem

...and TIMKEN® bearings pay for themselves over and over and over in operating and maintenance savings



THERE'S only one way to *cure* the hot box problem. That's to eliminate its cause. Unlike costly devices which merely serve as "crutches" in an attempt to improve friction bearing performance, Timken® tapered roller bearings eliminate the *cause* of hot boxes—the friction bearing itself.

BIG ADDED SAVINGS

In addition, Timken bearings drastically reduce the costs of bearing inspection and lubrication. Railroads must still face these costs even when they "doctor" friction bearings with crutch devices. With Timken bearings, terminal bearing inspection time is cut 90%, lubricant costs are reduced as much as 89%. In fact, the Timken heavy-duty type AP (All-Purpose) bearing assembly can go for three years without adding lubricant. When the day comes that all railroads go "Roller Freight", they'll save more than $190 million a year, earn an estimated 22% net annual return on the investment.

Timken bearings do away with hot boxes because they roll the load instead of sliding it. Metal-to-metal sliding friction is eliminated. And the tapered design makes Timken the only roller bearing you can *count on* to not only *cure* the hot box problem but also to reduce maintenance and operating costs to a minimum. The taper in Timken bearings prevents lateral movement. Result: there's no pumping action—less lubricant is needed; there's no scuffing or skewing—bearings last longer.

To insure bearing quality every step of the way, we make our own steel. We're America's only bearing manufacturer that does. And we make it nickel-rich for superior toughness.

NEW CONVERSION PLAN

When you consider the added cost of buying and maintaining "crutch" devices for friction bearings, the price gap between friction and roller bearings is smaller today than ever. Now, a practice adopted by one major American railroad promises to shrink it even more. This railroad has in effect a practical program for converting to "Roller Freight". Here's how it works. Every freight car coming into the shops for major repairs is being converted to roller bearings. This permits a steady shop and labor schedule and allows the railroad to pay for its conversion to roller bearings over a period of years.

So, instead of "making do" with unsatisfactory friction bearings and costly "crutches", invest to *solve* your journal bearing problems. Make sure you *cure* the hot box problem and bring your operating and maintenance costs down to rock bottom. Get Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

Only TIMKEN® bearings cure the hot box problem and cut operating and maintenance costs to a minimum